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ABSTRACT

This report presents the results of a survey conducted by EURYDICE of 30 countries (i.e., the 15 European Union [EU] member states, the 3 European Free Trade Association/European Economic Area countries, and the 12 pre-accession countries) that reviewed progress in incorporating information and communication technology (ICT) into national education systems. The survey covers the incorporation of ICT into education systems at all levels, including initial and inservice teacher training, and sets out to answer the following questions: (1) What are the aims and strategies underlying policies to introduce ICT into education? (2) What are the specific measures implemented (e.g., national initiatives, action plans, pilot projects, etc.)? (3) How is responsibility for ICT in education shared among the various administrative levels? and (4) What public/private partnerships have been established or are planned in order to implement these initiatives on a broad scale? The report covers three areas of concern: a survey of aspects of the debate on how ICT should be brought into education, together with a review of EU initiatives in this area; a summary of types of action implemented in the 30 countries; and separate reports based on the replies of each country to the four questions above. (Contains 25 references.) (MES)

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Eurydice
The Information Network on Education in Europe

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'Seduced by the effortless gathering of data, we discount the costs of turning data into information, information into knowledge and knowledge into wisdom.'
B. Harris, 1987.

Quotation taken from: *Cities and regions in the electronic age*, p.395. In Brotchie, J.; Hall, P. and Newton, P. (eds.). The Spatial Impact of Technological Change. London: Croom Helm, 1987.

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FOREWORD

Most European countries have now stated that the incorporation of information and communication technology (ICT) into their education systems is a crucially important objective. And, in the same frame of mind, the European Union has recently launched the eLearning initiative and action plan.

This clear demonstration of political intent leads on to many further questions. What ambitions govern the implementation of these policies for ICT and in accordance with what strategies? What position and role are conferred on ICT and with what repercussions for whole education systems and each of their components? Under what circumstances will ICT contribute to a profound change in systems or will it, on the contrary, do no more than modernise them?

In order to consider these questions in conjunction with the policies now being implemented throughout Europe, Eurydice decided to carry out a survey on how ICT is being introduced into the education systems of 30 countries, namely the 15 EU Member States, the three EFTA/EEA countries and 12 pre-accession countries (1). In cooperation with the Swedish presidency of the European Union, the European Commission and the Swedish Eurydice National Unit, the Eurydice European Unit (EEU) prepared a questionnaire which was sent in November 2000 to all Units in the Network. The answers to it from each country were prepared on the basis of a partnership between the National Unit and ministerial departments concerned. At the end of January 2001, the data gathered in this way was sent to the EEU which analysed it.

An intermediate version of the results of the survey was published for the Fifth Conference of European Education Ministers held in Riga (Latvia) on 29-30 June 2001. Delegations of the ministries of education of Member States of the European Union, the pre-accession countries and the EFTA/EEA countries took part in this conference organised jointly by the Swedish presidency of the European Council, the European Commission and the Latvian Ministry of Education.

The survey covers public policies for incorporating ICT into education in schools, higher education (2) and initial and in-service teacher training.

(1) The following countries are thus covered:
- Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Finland, Sweden and the United Kingdom as EU Member States;
- Iceland, Liechtenstein and Norway as EFTA/EEA countries;
- Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia, Cyprus and Malta as countries included in the European Union pre-accession strategy.

(2) Information gathered on this level of education is limited to centrally implemented measures, and does not cover the many initiatives of higher education institutions which have the autonomy needed to undertake them.

The questionnaire sent to the National Units was primarily concerned with the following:

- the aims and strategies underlying policies for introducing ICT into each education system and its constituent levels,
- specific measures implemented (national initiatives, action plans, pilot projects, etc.),
- how responsibilities are shared in this area between various administrative levels,
- the public/private partnerships either established or envisaged for the purpose of implementing these initiatives on a large scale.

On the basis of this survey, the following pages provide a summary of the main issues in the debate on the incorporation of ICT into education systems, together with a review of EU action in this field (Chapter 1), an overview of the various kinds of initiative implemented in the 30 countries which contributed to the survey (Chapter 2) and a set of individual country reports (Chapter 3) covering in each case the aims, strategies, examples of public/private partnerships, the way in which responsibility is shared among various administrative levels and the main programmes and schemes introduced.

In the present survey, the expression *information and communication technology*, or ICT, covers computers, computer networking (the Internet and intranet) and multimedia. The term *incorporation*, where used, should be interpreted in its broadest possible sense as a virtual synonym of *introduction, presence* or *use*. The wide variety of terms, practices and approaches encountered in the countries covered rules out any more precise definition. Furthermore, ICT has been considered both as an educational resource or tool and a subject for study in its own right. In the latter case, however, the discussion has been limited to basic education in ICT for the greatest possible number, without considering specialised or vocational training courses.

We hope that this book will help all those interested in what is a highly topical subject, namely the incorporation of ICT within education systems, to gain greater insight into how educational policies in this area are changing in Europe.

Luce Pépin,
Head of the Eurydice European Unit
July 2001

I. ICT AND EDUCATION: DISCUSSION AND ACTION AT EUROPEAN LEVEL

1 *The terms of the debate*

ICT has induced sometimes radical changes in certain sectors of activity. Is it to be expected that changes on the same scale will occur in education systems and, if so, with what consequences?

The first World Education Market (WEM) which took place in Vancouver in May 2000 and was held again in May 2001, gave some idea of the magnitude of what is at stake. Ministers and public bodies representing around 30 countries mixed freely with the publishers of multimedia products, designers and providers of on-line services, and computer firms which are becoming increasingly interested in the education and training sector. Firms are now offering immediately available on-line training programmes, and are planning to extend their activities to the field of education, particularly in the school support service sector. Under these circumstances, the role of the public authorities must in any event be reconsidered, primarily as regards the need to guarantee universal access to knowledge and quality content, and the preservation of cultural identity.

Over and above its commercial implications, ICT may be credited with raising once more the question of education as a means to individual self-determination and a better life (Wolton, 2000). For a long time, educating free individuals able to develop a critical outlook very largely depended on the amount of information accessible to them. There was therefore a tendency to equate self-determination with the ability to acquire a greater degree of information and knowledge. Today, however, accumulation of a very considerable body of information is materially and technically straightforward. What counts now is to know what to do with it. The ability to discriminate so that information is turned to good account has acquired novel significance in relation to the ability to obtain it.

ICT has led to reconsideration of priorities in education. Naturally, the new technologies are potentially vehicles for change and innovation. In particular, they may encourage pupils to abandon passive listening in favour of more responsive engagement, help to bring the outside world into the school and more generally change the way education is provided. But the aims of education and the decisions underlying them still have to be geared to making the most of this potential. The mere presence of ICT is not in itself sufficient. Present evidence seems to suggest that this is not what generally occurs. ICT as used in education would appear to have had very little impact on traditional teaching methods and the way schools normally operate.

Cultural considerations also have an important bearing on changes in education systems vis-à-vis the advent of ICT. Without wishing to rekindle a Manichean kind of debate in which technical culture was long set against humanistic culture, it is nonetheless evident that each national

culture has a different view of ICT, depending on its position in relation to either of these extremes. Depending on circumstances, ICT may either be harnessed to subordinate technical tasks or, on the contrary, be fully exploited as a means of exchanging and communicating information and gaining access to knowledge.

Prevailing opinion, extensively relayed by the media, projects a fairly general consensus on the positive aspects of ICT for educational purposes. Indeed, ICT is sometimes perceived as capable of revolutionising the whole debate on the role of education and how it should be provided. The present survey has set out to review the various strategies and initiatives implemented in the countries covered. It also seeks to situate these initiatives with due regard for prevailing values and overall educational objectives for which ICT cannot be a substitute.

Two other aspects have to be borne in mind in the present discussion. The first concerns the fact that, aside from the question of ICT, the current period is one in which the practices, organisation and principles of schools and the education systems to which they belong are being questioned and changed with a view to the provision of lifelong education and training (Papadoudi, 2000). Models and techniques for organising, managing, producing and transmitting knowledge, and for catering simultaneously for the needs of different groups etc., are being considered from a fresh angle. This does not mean that we can speak in terms of a complete break with the former frame of reference and the emergence of an entirely new one. However, the analysis has to examine the issue of ICT in conjunction with these broader challenges facing education, rather than obscuring them by foreshortening the thought and discussion entailed.

The second aspect that has to be borne in mind is that the entrenchment of ICT, like that of any technological tool, has at least two main types of impact (Salomon, 2000). A gradual and cumulative but quite possibly profound influence on particular practices, but also a more immediate visible impact on them. The first is slow, cannot generally be forecast and only becomes fully apparent after a certain period. This increases the likelihood that insufficient attention will be paid to its implications when implementing measures in the field of ICT which at first sight may seem appropriate merely because they are possible. Even if, in reality, the foregoing two kinds of impact are not totally distinct from each other, we can clearly only discuss the latter (short-term) effects in the pages that follow. Our focus, therefore, will be on how ICT is becoming an integral part of education, as we attempt to analyse the various initiatives in terms of their possible impact on those involved, on educational practice, and on the organisation of schools and of the entire education system.

ICT in relation to the educational players involved

ICT helps to make the education system more responsive to its environment. In this respect, it has an impact on relations between schools and the broader educational community, parents, local authorities, firms and associations, etc. Teachers and learners are, however, those most concerned.

Teachers

Since the beginning of the 20th century and particularly since the Second World War, several generations of teachers have been confronted with the advent of new media. Adopted first in daily life and then gradually in the world of education, other means of communicating information have developed alongside books. The use of instruments other than the voice of the teacher or the school textbook is therefore nothing new. It has sometimes even been a central element in the development of so-called new educational theories (including Montessori, Freinet, etc.).

Nevertheless, the introduction of ICT into education systems calls first and foremost for clarification of the role of the teacher. Most of those involved in the ongoing debate acknowledge that the essence of educational activity still consists in the direct contact between teacher and pupil. The part played by particular teaching methods and resources, and therefore ICT, in the process of teaching and learning seems to be increasingly important, and likely to lead eventually to changes in the distinctively typical tasks performed by teachers.

Even where education makes extensive use of ICT, it should not relax the professional demands it makes on teachers – quite the contrary. In addition to a more comprehensive and updated form of training, redefining the role of teachers could result in a new set of responsibilities, as well as reorganisation of the time devoted to lessons and to preparation for them. As soon as individual learners can acquire virtually any information, the role of intermediaries, including teachers and all those who unlock access to information, knowledge and culture (including research librarians, etc.), is set to be rethought and enhanced. It is worth noting that studies carried out in the United States draw attention to the very heavy workload now faced by teachers as a result of the inclusion of ICT in education (Farrington, 2000).

Ready access to more extensive and varied sources of information and knowledge mean that it is all the more important for teachers, alongside children, to place the data at their disposal in perspective. Here, once more, the particular culture of a system will have some bearing on the role invested in teachers. In some countries, teachers are regarded as vital in protecting minors from information regarded as undesirable or dangerous. In others, education attaches prime importance to nurturing critical faculties at an early age, so that the learners are more readily left to judge quality themselves.

Learners

Most of those who express firm opinions on the incorporation of ICT into educational processes draw attention to its numerous advantages for learners: they include access to many varied sources of information, flexibility in relation to the traditional restrictions of time and space, respect for individual rates of learning, greater autonomy and, in certain cases, the greater convenience of learning through the use of ICT facilities rather than in contact with teachers, etc.

However, these positive aspects should not conceal the need for better understanding and/or consideration of matters such as the following:

- the expectations and requirements of different groups of learners: in relation to the development of lifelong education and training, it would be unwise to assume that the needs and expectations of learners vis-à-vis ICT are the same, irrespective of their age; furthermore, they do not constitute a homogeneous group of people with the same level of motivation, who need nothing more than exposure to ICT in order to benefit from it;
- the very nature of specific forms of cognitive learning: these are the result of efforts, on the part of learners, to restructure what they have learnt previously; the enormous strides forward as regards the time needed to access information have in no way lessened the time learners need to assimilate it fully; with demands on learning increasing, it would be mistaken to assume that the period needed to appropriate knowledge will diminish;
- the impact of the presence and use of ICT on implicit learning: defined by John Dewey as an activity that is collateral to the acquisition of other skills or forms of knowledge, such as the ability to read, write and count, etc., learning of this kind embraces attitudes, forms of behaviour and values which correspond to the process in which children relate to social norms from primary school onwards; today, these have assumed fresh importance in relation to the debate on basic (so-called new) skills, and in particular social skills, mastery of which has assumed the nature of an obligation for anyone who has acquired an education.

Irrespective of the potential of ICT, it nonetheless carries with it restrictions with which learners and those who accompany them have to come to terms. It also has to be related to the information requirements of learners which vary depending on their aims, skills and the strategies they mobilise to acquire them or, in other words, on the relevance of a particular requirement for the action of the user concerned.

The introduction of ICT into the educational process is also linked to contrasting philosophical attitudes *vis-à-vis* learners. Some may be identified with an approach in which the latter have to be closely supervised, while others acknowledge that learners themselves are best placed to guide their own learning. Yet others correspond to a more pragmatic outlook in which free exploration is combined with active guidance in a supervisory context. ICT is not in itself necessarily going to work better for any one of these approaches than for others. On the contrary, it is the particular philosophical approach advocated that will determine how ICT should be involved in the educational process.

ICT in relation to arrangements for teaching

The use of the means mobilised for teaching purposes, and the development and organisation of teaching materials are part of what is involved in preparing the curriculum. It is therefore also important to attach special importance to the definition of ICT as a teaching resource in order to appreciate its identity and the way it is activated.

ICT may perform different tasks in the arrangements for teaching: it may be used for simple communication purposes or, through the creation of documents, to provide information,

awaken curiosity, strengthen intellectual skills, or for organisation, assessment and practical applications such as simulation.

Furthermore, its use for communication purposes is liable to assume special importance from the intercultural standpoint. This is borne out by the establishment of many class websites and the proliferation of electronic communication between classes in different countries. The Internet is thus perceived as a tool which is capable of offering a basis for the development of intercultural teaching, though without becoming its only support (Si Moussa, 2000). More important still are the will to engage in such teaching, along with a definite plan for intercultural communication, both of which condition the use to be made of ICT in a particular educational context.

Furthermore, it would appear from observing classes in which learning activities are centred on the use of ICT, that they are more convivial and conducive to greater cooperation than other classes (Si Moussa, 2000). The level of individual activity is more regular and sustained. However, similar conclusions might be drawn from the observation of teaching arrangements based on well conducted group activity not requiring the use of ICT. Conversely, classes that do use it continue also to rely on traditional methods of teaching. Where this occurs, they do not result in the observation of any particular signs of increased attention or active involvement on the part of pupils or students (Plomp et al., 1996).

Nevertheless, ICT provides opportunities for introducing new learning situations into classrooms, by stimulating the problem-solving skills of pupils who are able to choose the strategies that suit them best, facilitating the integration of different forms or branches of knowledge, as well as the development of multidisciplinary projects, and by encouraging the growth of 'metacognitive' skills (self-evaluation of the learning process). ICT is also adapted to inductive reasoning which is played down in some education systems more inclined to place a premium on the application of rules. Finally, ICT – and particularly the Internet – are also likely to boost the substantial growth of desk-based research and, by the same token, a certain approach to structuring knowledge in schools wishing to regard written or printable material as the most important source of knowledge.

ICT in relation to the way education is organised

The introduction of ICT into education systems has repercussions both for individual schools and the entire education system.

For schools, ICT is a support mechanism enabling them to communicate with their immediate environment (parents, teachers, pupils and, in certain cases, various administrative levels), as well as with a whole range of bodies which are also potential partners (including local authorities, associations, firms and other schools, etc.). ICT therefore amounts to a real opportunity for bringing schools into active contact with the wider educational and local, regional, national or European community, which is now considered highly desirable by many commentators. Most websites developed in schools remain classroom-based. It is within a particular class that they

originate, come to fruition and are monitored and updated, as the number of school class sites amply demonstrates. However, school-based websites are also gradually becoming more common with the expansion of school facilities and changes in staff skills and distinctive responsibilities, in which growing importance is attached to aspects concerned with communication.

Internal school administrative procedures may also change significantly as a result of the introduction of ICT.

As far as education as a whole is concerned, political pronouncements in support of ICT are indicative of the hopes pinned on it as a means of improving the entire enterprise. They highlight how it can, for example, remedy malfunctioning and shortcomings, modernise systems overall, and inject innovation into communication and management. Much is also made of its potential profitability in that, over and above a given level of teaching staff, distance education seems especially cost-effective and capable of justifying its substantial initial outlay in terms of equipment and facilities.

A summary of the main issues

In itself, ICT is not necessarily going to radically change education systems. This hypothesis is based on two assumptions (Salamon, 2000).

The first corresponds to the observation that technological progress has to date usually been harnessed, on its emergence, to the same kind of purpose as the resources which preceded it (radio and television, etc.). In this way, its relationship with the philosophical and cultural roots of an education system is preserved. The unexpected effects of a new technology have always aroused suspicion, as they may be numerous and some of them may be incompatible with the aims of an education system. Education, indeed, is not intended to drift with the vagaries of fortune but, on the contrary, achieve precise unwavering objectives. However, while new tools can do no harm once they have been subjugated, neither are they likely to lead to necessary improvements or real change.

The second assumption is the widespread conviction that technology is itself going to change the order of things for the better. Naturally, as a result of technology it is possible to supply and secure access to information more easily and rapidly, solve certain problems and devise new combinations of tools, etc. Technology may also enable a redistribution of effort so that less time and energy are devoted to recall and memorisation and more to problem-solving and the acquisition of meaningful knowledge. Furthermore, it may give rise to a reorganisation of working time within schools. However, technology cannot in itself serve as a reference framework or map out a course of action. And the opportunities which it provides do not come about automatically. On the contrary, they are the result of deliberate determined effort driven by an overall view of what education should be seeking to achieve. Due regard for the educational significance of ICT and quality assurance of the tools and prodcuts developed are crucial aspects of this basic strategy.

The same determination is needed to ensure that ICT does not become a source of further inequality, with the digital divide accentuating already existing differences. In a recent study, the OECD (1) has identified several factors that are determinant in creating this divide, such as variable ease of access to computers and the Internet, depending on socio-economic and/or ethnic background, as well as on age and educational background. Geographical differences between towns, regions and countries are also liable to fuel the digital divide. For this reason, some OECD member countries have launched programmes for the benefit of children and schools in disadvantaged areas, besides committing additional financial support to investment in ICT, and providing training for the least qualified workers, tax relief for firms and donations for local technological centres, etc.

Furthermore, both in education and other fields, changes are not caused by the appearance of a simple tool however effective it may be. Instead, they tend to be the resultant of the combined influence that social and technological innovation have on each other. The comprehensive integration and significant development of ICT in education thus depend to a very large extent on circumstantial or structural factors. With few exceptions, most countries are still involved in introducing ICT, to a greater or lesser extent, into their education systems. Priority is thus often attached to mobilising means, sometimes to the detriment of more careful thought as to their ends. If ICT is really to represent an opportunity to be grasped and help social and educational development to progress, the balance in emphasis should be redressed as soon as possible. A sequential approach (facilities first and then the objectives) is not necessarily more productive than a simultaneous one (with facilities provided while goals are being determined), in so far as operations to provide facilities are relatively rapid compared to the gestation of a new global frame of reference for an entire system. It is for this reason that the debate recently initiated by the European Commission and the Member States on the concrete aims of education systems as regards quality, effectiveness, lifelong access and responsiveness to the world beyond Europe is so crucial.

The relations between ICT and education are thus complex and cannot be reduced to the simple availability of material resources within the educational process. If they cannot in themselves change the system, they inject it simultaneously with different concepts and new kinds of logic. For example, the growing diversity of technological tools available to teachers increases the various ways in which such tools may be used, as well as the heterogeneity of educational practice and forms of training. ICT is therefore a partial means to achieving a vision of education, and also a gateway to new horizons. It assumes full meaning only in relation to changes in the educational process.

2 *The action of the European Union*

At the end of the 1970s and start of the 1980s, public initiatives were launched in some European countries with a view to bringing ICT into education. For most of the time, this meant

(1) Organisation for Economic Cooperation and Development.

that it was regarded as a subject for teaching, with a precisely circumscribed position in the curriculum. At that stage, ICT was not really regarded as an extensively used teaching resource, or as a subject with a significant contribution to make across the curriculum as a whole.

However, from that time on, the development of multimedia computers and growing awareness of the potential of ICT as a teaching resource led to the proliferation of pilot projects and public financial support, in particular for the development of educational software. Meanwhile, the major computer industries were quick to grasp the potential of ICT in terms of educational products and services.

Today, most European countries are becoming involved in initiatives involving multimedia facilities, but also local connections within classes and schools, with access to regional, national and international networks via the Internet. By this means also, education systems are more readily moving into partnerships with museums, local authorities, libraries, firms and associations, etc.

From 1983 onwards, the European Commission acted as a catalyst and gave the lead by encouraging the incorporation of ICT into education and vocational training (1). For this purpose it above all lent its support in that period to the organisation of seminars, symposia and meetings enabling the Member States to pool their experience. Then, in 1986, the European Community programme, COMETT, involving cooperation between universities and firms throughout Europe to develop education and training in technology was adopted. In 1990, the Community programme, Eurotecnet, was also launched for the promotion of innovation in vocational training to take account of ongoing technological change and its impact on qualifications and employment (2).

The Commission published its *Memorandum* on open and distance learning in the European Community (3) in 1991, since when its action in the field of ICT has been consolidated and steadily expanded.

The *Educational Software and Multimedia* Task Force

An *Educational Software and Multimedia Task Force* was established in March 1995 (and continued its activities until 1998) so that six EU programmes (4) would join forces to speed up the

(1) See in particular:
- the Resolution of the Council and of the Ministers for Education meeting within the Council of 19 September 1983 on measures relating to the introduction of new information technology in education;
- the Conclusions of the Council and of the Ministers for Education meeting within the Council of 4 June 1984 on technological change and social adjustment;
- the Resolution on education and training in new technologies of 11 November 1986.

(2) The activities associated with Comett and Eurotecnet were subsequently incorporated into the Leonardo da Vinci programme.

(3) See also the Conclusions of the Council and Ministers for Education meeting within the Council of 27 November 1992 on the development of open and distance learning.

(4) Socrates, Leonardo da Vinci, Targeted Socio-Economic Research, Esprit, Telematics Applications and Trans-European Telecommunications Networks.

development of educational and training technology and its application throughout the EU. This cooperation led to the organisation of a joint call for proposals unlocking a Community contribution of EUR 49 million used to support 46 educational multimedia projects involving over 400 firms and institutions, around half of which were universities or schools.

The *Learning in the Information Society* Action Plan

In 1996, the European Commission launched an action plan called *Learning in the Information Society*. In so doing, it underwrote the political determination of the Member States to become firmly committed to making the multimedia in general, and the Internet in particular, an integral part of teaching practice. The plan involved the following four lines of action: encouraging the establishment of electronic networks between schools throughout Europe; boosting the development of educational multimedia resources; promoting teacher training in the use of ICT; and providing information on the potential of multimedia and audio-visual educational tools and resources.

The development of the European multimedia schools network *European Schoolnet* (EUN) cofinanced by the Educational Software and Multimedia Task Force has made a substantial contribution to implementation of the first line of action. EUN was launched in Brussels in December 1996 by the Swedish Minister of Education, Ylva Johansson, and received the support of the education ministers at an informal meeting of the Council in Amsterdam in March 1997. Operational since September 1998, *European Schoolnet* (*) is a European electronic network of national and other computer networks at present linking up the ministries of education in 23 European countries (namely the 15 EU countries, Norway, Switzerland, Slovenia, Iceland, Poland, Hungary and, as observers, Israel and Morocco). Its purpose is to encourage the exchange of information and experience among players in education, training and culture, and so fuel discussion in this area at national and European level. It also aims to establish a virtual European campus which will constitute a gateway to national and regional educational networks and related teaching resource centres. In addition, the network seeks to become a European vehicle for innovation and exchange.

The second line of action has been implemented by boosting awareness and action on the part of European players in the audio-visual and publishing sectors. A database on European educational multimedia publishers and products was designed in 1997, while main areas of cooperation were identified and a European Education Partnership (EEP) was set up in September 1997. The EEP represents many different interests in the ICT, audio-visual and publishing sectors, as well as the educational community in general.

Besides activity to bolster national strategies and EUN initiatives in this field, the Community programmes have made a contribution to the implementation of the third line of action for the promotion of teacher training in ICT.

(*) Website: http://www.eun.org

As regards the fourth line of action (more effective provision of information on the potential of multimedia and educational resources), the Commission has launched a series of activities and, in particular, a week of promotional events, known as Netd@ys Europe, in schools since 1997 and a European competition for the best educational multimedia. Netd@ys Europe is a European Commission initiative to boost the use of new technologies in schools. Its purpose is to ensure that the potential of the new media in the educational and cultural fields becomes more widely known.

The changing role of teachers, trainers and project leaders and improvements in the quality of life, primarily among the disadvantaged or those who live in remote areas, have been the two priority concerns of the Netd@ys 2000 initiative which, amongst other things, focused on the following limited number of topics: citizenship; European cultural identity and diversity; equality of opportunity; education and training for a better practical grasp of the new media; and a focus on the world beyond Europe.

The Socrates Programme

In the Socrates Programme, the *Open and Distance Learning* action of the Programme's first phase (1995-1999) helped to incorporate ICT into education systems. The *Minerva* action which carries this development forward in the second phase (2000-2006) supports four specific types of activity:

- action and/or research aimed at highlighting the impact of ICT or open and distance education on the organisation of processes and models for teaching and learning;
- actions geared to providing the methods, products and resources which are needed to develop innovative learning environments and should be transferable;
- the establishment of contacts between producers, users and managers at European level, especially in the case of teacher training bodies and resource centres;
- the development, at European level, of information systems and services concerned with educational methods and resources involving the use of ICT and open and distance education.

The eLearning initiative and action plan

The eLearning initiative and subsequent action plan to explain the procedures and means for its implementation constitute the main recent Community action regarding ICT applied to education and training.

The eLearning initiative was adopted by the European Commission on 24 May 2000 and formally welcomed by the education ministers and Feira European Council in June the same year. The eLearning action plan was adopted on 28 March 2001. Together, they both seek to mobilise players in the fields of education and training, as well as those concerned in the social, industrial and economic sectors, for the purpose of making lifelong education the driving force of an interdependent and harmonious society. They are also aiming to nurture a com-

petitive economy, to promote employability and adaptability ([9]), to compensate for the skills deficit associated with the new technologies and ensure more effective 'social inclusion' ([10]).

The eLearning initiative extends the global eEurope action plan in the fields of education and training. The aim of this plan, which was also adopted by the Commission on 24 May 2000, is to enable Europe to make the most of its strengths and overcome obstacles to the increased take-up and use of digital technology ([11]). It is helping to achieve the major goal established for the Union at the Lisbon European Council on 23-24 March 2000, namely that of ensuring that Europe becomes the most competitive and dynamic knowledge economy, capable of sustainable economic growth coupled with a quantitative and qualitative improvement in employment and greater social cohesion.

The four lines of priority action developed by the eLearning initiative are as follows:

- improving infrastructure and facilities to enable all classrooms to have Internet access, with a ratio of 5-15 pupils per multimedia computer by 2004 ([12]), and to establish a trans-European network for communication between research institutes, universities, research libraries and schools while gradually providing other learning centres (such as libraries, cultural centres and museums) with appropriate facilities;
- a drive to deliver training at all levels which provides for the acquisition, by the end of 2003, of a digital culture by pupils before the completion of their schooling, offers incentives to teachers to use digital technology for educational purposes, and includes the adaptation of school curricula, opportunities for each worker to acquire digital culture, and the establishment of on-line learning platforms by the end of 2002; such an effort also presupposes the adoption of a European framework for novel skills whose acquisition is certified, in particular, by a European diploma in basic information technology skills;
- the development of quality content and services, which implies closer links between the European multimedia industry and training systems, the establishment of quality criteria and content evaluation methods, and speeding up interconnections between schools and universities;
- the development of cooperation.

([9]) The *European Employment Strategy*. The strategy rests on four pillars, namely employability, entrepreneurship, adaptability and equal opportunities. (http://europa.eu.int/comm/employment_social/empl&esf/ees_en.htm)

([10]) The eLearning Action Plan – Designing tomorrow's education, Communication from the Commission to the Council and the European Parliament, COM(2001)172 final, 28.3.2001. (http://europa.eu.int/comm/education/elearning/doc_en.html)

([11]) The eEurope 2002 Action Plan: an information society for all, prepared by the Council and the European Commission for the Feira Council, 19-20 June 2000. (http://europa.eu.int/comm/information_society/eeurope/actionplan/index_en.htm)

([12]) On 14 March 2001, the Commission stated in a document about evaluation of the eEurope initiative, that the aim now was to achieve a ratio of one computer for every five pupils in all classrooms. The Commission has also said that the Member States should now encourage broadband Internet access in schools.

These initiatives are being developed and broadened by the eLearning action plan which comprises six main actions as follows.

- devising a decision-making support tool in the form of an information base that contains qualitative and quantitative indicators regarding the use of ICT for educational purposes;
- setting up a European exchange and research platform based on existing structures in the Member States, in order to make the most of innovative applications of the new technologies in education and training (possible applications of emergent technologies, such as digital television and satellites in learning environments, the establishment of virtual campuses and virtual mobility, and use of the new technologies to fight malfunctioning in conventional education);
- developing infrastructure through the establishment of digital networks in universities and disadvantaged regions;
- incorporating digital culture into basic skills that should be acquired throughout life, and recognising them by means of a European diploma in information technology;
- training teachers, identifying and promoting best practice, and investing in research on the qualifications required for future teachers and trainers;
- developing quality educational content through the introduction of an inventory of quality certification systems in cooperation with the member countries, sound security precautions for educational and cultural websites and thinking and discussion about intellectual property rights.

In order to achieve these aims, the Commission intends to mobilise mechanisms and policies for which it is responsible. They include the education and training programmes (Socrates, Leonardo da Vinci, Youth), the Fifth Framework Programme for Research and Technological Development (the Information Society Technologies Programme - IST, the Programme for Targeted Socio-Economic Research), the programmes and actions for technological deployment and competitiveness (Ten Telecom, eContent, Go Digital), and the Structural Funds which are already investing in equipment, facilities and training for the new technologies, particularly in disadvantaged regions. The Commission will also take action concerned with standardisation to provide for interoperability and the circulation of e-Learning content and services. The actions envisaged will also be reinforced by implementation of the European Investment Bank Innovation 2000 Initiative. With a three-year budget of EUR 12-15 billion, this programme offers an opportunity to support investment in human capital and innovation.

The eSchola action implemented as part of the eLearning initiative complements the Netd@ays, in that it is a more concrete targeted educational venture. It is seeking to demonstrate the information and communication potential of the new technologies, as well as to encourage schools and teachers to exchange good practice and learn from each other. In 2001, this campaign to heighten awareness regarding the use of Internet in schools, which has been organised by *European Schoolnet*, the European Commission and the Swedish presidency of the EU, was reflected in a week (from 7-11 May) devoted to ICT and e-Learning in schools. At a later stage, *European Schoolnet e-Learning 2001* prizes will be awarded for resources and examples submitted in the following categories:

- *eSchool*, which relates to schools or groups of schools that use the Internet systematically;
- *eTeaching*, which is intended for teachers who incorporate ICT into their teaching activity;

- *myEurope*, which is for teachers or schools offering special education on Europe;
- *eTeacher Training* which is intended for bodies for teacher training.

A website is used to help promote events and good practice ([12]).

The IST Programme

The Information Society Technologies Programme (IST) is a major research and development theme in the Fifth EU Framework Programme for Research and Technological Development (1998-2002). As such, it is the successor to the Avanced Communications Technologies and Services (ACTS), Esprit and Telematics Applications Programmes of the Fourth Framework Programme, and now brings their activities together within a single programme which reflects the increasingly close interrelationship between information processes, communications and multimedia technology. The IST Programme has a EUR 3.6 billion budget and is being implemented by the Information Society Directorate-General of the European Commission.

The strategic aim of the Programme is to enable Europe to benefit from the advantages of the information society by speeding up the emergence of the latter and ensuring that the needs of individuals and firms are satisfied. This corresponds to four objectives:

- satisfying the needs and expectations of private individuals in terms of general interest high quality services provided at reasonable cost;
- enabling European firms, workers and consumers to innovate and work more effectively, by establishing the basic conditions for sustainable growth and strong value added employment and improving the quality of life at work;
- strengthening the dominant position of the multimedia content sector by encouraging it to achieve its full potential;
- supporting the development of technologies and speeding up their establishment in Europe.

The Programme is structured into four key actions:

- *Systems and services for the citizen:* intervention in the areas of administration, the environment, transport and health and on behalf of people with special needs, so that all European users may benefit from recent advances in computer science, communication and intelligent interfaces;
- *New methods of work and electronic commerce:* encouraging new methods of working and establishing electronic commerce. This action is based on the governing vision of a network economy in which consumers, workers and firms may come together and interact with each other as the result of an all-embracing infrastructure.
- *Multimedia content and tools:* developing interactive electronic publishing, digital heritage and cultural content, and access to human language technologies etc., as well as boosting

([12]) Web site: http://www.eun.org/cn/eschola/index.cfm

the development of new forms of interactive and visual content so that people have improved access to culture and science.

- *Essential technologies and infrastructures:* action in ICT-related fields: mobile and personal means of communication, microelectronics, the development of software and corresponding technology, systems and services, simulation and visualisation technologies, new interfaces, the development of peripherals and subsystems and microsystems.

In order to incorporate the new ideas, these actions have been balanced by the Future and Emerging Technologies (FET) action. It is concerned with longer term high-risk research which is promising in terms of significant industrial and social impact.

The European Computer Driving Licence

Although the European Computer Driving Licence (ECDL) is not the outcome of a project initiated by the EU, it has been the subject of discussion within the Community and the European Commission regards it as an example to follow and implement.

The ECDL was introduced for the first time in Sweden in August 1996. However, the concept itself originated in Finland, where the Finnish Association for Information Processing initiated the Finnish Computer Driving Licence in 1994.

The ECDL is an initiative of the Council of European Professional Informatics Societies (CEPIS) which brings together 21 associations and over 250,000 professionals. It is administered by the ECDL Foundation.

Devised at the outset as a European standard for information technology skills, the ECDL now seeks to become the global standard for such skills. Its aims are as follows:

- to improve knowledge about information technologies, as well as the skills levels of citizens in Europe and throughout the world in the use of personal computers and common computer applications;
- to raise the productivity of employees who use a computer at work;
- to enable a better return on investment in information technology;
- to offer a basic qualification enabling everyone to become involved in the information society.

The ECDL comprises seven modules and, when candidates register for the qualification procedure, they receive a European computer skills card which records all data regarding the procedure. They are awarded the Licence when they have satisfactorily completed the seven modules. The ECDL has now been introduced in 22 European countries in which it has been a great success. This applies particularly to the Nordic countries where it has become a very popular means of certification among employers and employees alike. In many countries also, programmes for the benefit of socially marginalised groups have made use of the ECDL as a means of certifying skills attainment levels. Furthermore, the ECDL Foundation is now examin-

ing what needs to be done for persons with physical handicaps to secure access to the test on the same basis.

Eurydice publications on ICT in education

General enthusiasm for the Internet has led to extensive national plans to provide schools with appropriate facilities. In order to rapidly measure the impact of these measures, national governments and the Commission have said that they need a detailed picture of the stage reached by the development of ICT and the Internet in educational institutions in the Member States.

It is against this background that the latest edition of *Key Data on Education in Europe, 1999-2000* (which takes 1997/98 as its reference year) has been produced for the European Commission jointly by Eurydice and Eurostat. For the first time, this publication includes a special chapter containing a set of indicators relating to ICT prepared by Eurydice on the basis of national contributions from the member countries of the Eurydice Network. The indicators were finalised during consultation and joint meetings with members of the Network and the national partners of Eurostat. They provide information on the following:

- national policies and official documents on the use of ICT;
- national bodies responsible for supervising those policies;
- national projects to introduce ICT;
- the schedule for their implementation;
- the sharing of responsibility for the purchase and maintenance of hardware;
- the distribution in specific budgets between expenditure on the purchase of equipment and on human resources;
- the aims of projects;
- the inclusion of ICT in the curriculum in primary, lower secondary and upper secondary education;
- the use of ICT in primary, lower secondary and upper secondary education;
- initial and in-service training of teachers in ICT.

A new separate edition of *Key Data on Education* in the field of ICT is currently being prepared, with 2000/2001 as its reference year ([14]). It will update the existing indicators and also include a further detail concerning the initial training of teachers in lower secondary education, namely the number of hours devoted to ICT in the course of their training.

([14]) This edition will be entitled *Basic Indicators on the Incorporation of ICT into European Education Systems: 2000/2001 Annual Report*.

II. Results of the survey

The most frequently cited aims of policies for introducing ICT into education systems, are (in descending order) the following:

- improve teaching and learning processes in order to enhance the general quality of education and the skills levels of learners (the French Community of Belgium, Spain, Ireland, Italy, Luxembourg, the Netherlands, Finland, Sweden, the United Kingdom, Norway, Bulgaria, Latvia, Lithuania, Hungary, Malta, Poland and Romania);
- provide for the access of everyone to ICT in accordance with the equal opportunities principle (the French Community of Belgium, Germany, Ireland, Luxembourg, the Netherlands, Finland, Sweden, the United Kingdom, Norway, Lithuania, Hungary, Malta and Slovenia);
- facilitate the development of lifelong education and training (the French Community of Belgium, the Flemish Community of Belgium, Austria, Finland, Sweden, the United Kingdom, Liechtenstein, Norway, Estonia, Cyprus and Lithuania);
- contribute to the development of an information society in the fullest possible sense (Portugal, Finland, the United Kingdom, Bulgaria, the Czech Republic, Estonia, Poland and Romania);
- lead people to develop responsible, critical and creative attitudes to ICT and make it easier for them to become involved in the information society (Germany, Greece, Spain, France, Italy, Luxembourg and Norway);
- support economic development and competitiveness (Germany, Greece, Sweden, the United Kingdom, Norway and Estonia);
- boost the labour market integration of young people (the French Community of Belgium, Germany, Sweden, the United Kingdom/Scotland and Liechtenstein).

Analysis of national policies reveals four main areas around which action to achieve the foregoing aims is concentrated, as follows:

- actions to enhance facilities and equipment (hardware and software),
- teacher training initiatives,
- the inclusion of ICT in courses,
- specific supporting initiatives.

1 *Action to enhance equipment and facilities*

The vast majority of initiatives to enhance equipment and facilities relate to the provision of modern multimedia facilities and network connections (intranet, the Internet and individual e-mail addresses, etc.) for schools, mainly at primary and secondary levels. In some systems, schools are being equipped in this way for the first time whereas, in others, it is more a question of updating facilities that fail to satisfy current requirements, or of increasing the presence and use of ICT and the number of those who derive direct benefit from it.

Some systems refer below to initiatives for the benefit of specific target groups (such as schools in rural areas, special education and the handicapped).

The allocation of appropriate equipment offering sound basic facilities and networking potential is also linked to the development of a whole range of on-line services intended, in most cases, for teachers and sometimes for learners. Among them are the pooling of educational resources (such as course teaching materials), educational software databases, the exchange of good practice, discussion groups on practice and methods, skills self-evaluation tools and the networking of digital libraries.

- In a first group of countries, efforts to provide facilities are focused primarily on the implementation of networks for the transmission of educational content and services. They include the Netherlands, Finland, Sweden, Iceland and Norway, as well as Germany, France, Ireland and the United Kingdom, all four of which continue at the same time to invest substantially in improving their basic facilities. For example, the German initiative 'D 21: innovation and jobs in the information society of the 21st century' is encouraging the development of on-line teaching and learning by means of a whole set of projects for the different levels of education, as well as the private sector and public administration.
- A second group of countries, while also working to develop this kind of network, concentrate more on providing schools with computers, general and educational software and Internet connections. Belgium (the French and German-speaking Communities), Italy, Luxembourg, Austria and Portugal are involved primarily in computer networking within the *European Schoolnet* initiative, whereas Denmark, Germany, Spain, Greece, Liechtenstein and Malta are developing their own national networks. Provision of basic facilities has not reached an advanced stage in the Czech Republic, Latvia, Hungary, Romania, Slovenia and Slovakia, which have nonetheless undertaken major network development initiatives.
- A third group of countries, namely Bulgaria, Estonia, Cyprus, Lithuania and Poland, are concentrating essentially on the provision of basic facilities (computers and Internet connections).

Generally speaking, most initiatives are concerned with equipping locations specially reserved for education and training, meaning schools (or very similar institutions). Measures to encourage the use of computers at a more personal level and to provide the appropriate facilities (portable or home-based computers) are far less common. Where they exist for the benefit of teachers, they are generally coupled with substantial training initiatives. Similar measures for learners are rarer still and targeted primarily at students in higher education by providing them with financial support. For example, Italy is planning to offer interest-free loans for the purchase of personal computers.

Other kinds of facilities, such as those for video-conferencing and televisual communication, are regarded as of very secondary importance.

Partnerships that include private partners are primarily involved in the provision of equipment and facilities, and especially Internet connections. While these partnerships extend across the whole of the EU, they are harder to develop in smaller countries because of their quantitatively

weak demand, and are significantly less numerous in the pre-accession countries. Where they exist, they are established following negotiations between the appropriate administrative levels and computer and software suppliers or telecommunications companies. They lead to the provision of schools with computers and software at preferential rates, and school connections that are either free or also at reduced rates.

The Flemish Community of Belgium and Norway have established partnerships enabling schools to obtain cheaply computers that are already configured. In Germany, an association of 120 high tech firms helps schools develop a computer infrastructure at reduced rates, while also offering them technical assistance, advice and services provided by qualified staff. In Sweden, teachers who have been trained keep their computer at the end of their course. In Iceland, IBM offers pilot upper secondary schools a wireless network infrastructure, while the schools, in turn, lease IBM portable computers for students and teachers.

As regards electronic networking and the distribution of products and services in Ireland, Intel has assumed responsibility for the development, maintenance and operation of the *Scoilnet* network for three years from September 1999. In the Netherlands, 75 providers make products and services available on the *Kennisnet* network and offer access to 200 other websites with on-line content and products developed, maintained and financed by publishers. In Norway, an Internet database matches the skills requirements of employers to potential employees who are appropriately qualified, and provides a market place for higher education institutions to promote their courses, often delivered electronically.

2 *Teacher training initiatives*

In nearly all systems, action in the field of teacher training is a top priority as regards the inclusion and use of ICT in education.

The action concerned relates to both initial and in-service training. It involves either inclusion in the training programme of modules or constituent courses devoted to ICT, or the establishment of innovative or less formalised arrangements.

The first possibility normally entails basic general training in the understanding and use of equipment and software. In most cases, this provision is for those intending to teach at primary and secondary level. Very occasionally, it considers ICT primarily in terms of its use for teaching purposes. Training in ICT may also be approached in relation to the teaching of specific subjects such as foreign languages or sciences.

While it was not the purpose of the present survey to analyse the content of training, some countries nevertheless provided information on the subject as indicated illustratively below.

- Greece offers both initial and in-service training for primary schoolteachers and in-service training for secondary schoolteachers, which is divided into the following three

levels: 1) training in basic computer skills; 2) incorporation of computer tools and ICT into the educational process and 3) familiarising trainees with educational software.

- There are also three levels of ICT training in Luxembourg and Finland which are concerned with in-service training of secondary schoolteachers and the initial and in-service training of all teachers, respectively. These levels are 1) mastery of rudimentary computer techniques for the use of basic software (Word), 2) knowledge of search engines, e-mail and understanding of the basic principles governing the use of ICT in teaching, and 3) advanced skills for the use of computer resources for the processes of teaching and learning (familiarity with appropriate educational software and available computer software, etc.) and the acquisition of specialised ICT skills relating, for example, to the establishment of suitable digital learning facilities, data analysis, advice and guidance for other teachers, and action as networking experts.
- Liechtenstein has identified the following four levels of training which correspond to four categories of teacher: 1) teachers who need their computer to prepare lessons, 2) teachers who need it to give their lessons, 3) computer science teachers and 4) teachers who make more intensive or specialised use of computers. Each type of requirement has its corresponding level of initial and in-service training for all levels of education.
- In Ireland, under the Training of Trainers Programme, the Department of Education and Science provides a wide-ranging programme of retraining for staff in first, second and third level education and training centres. The training provided is focused on identified needs at each level and varies widely in content, duration and mode of delivery, both within and between sectors. In the university sector, the programme is managed and coordinated by the Higher Education Authority. Universities are invited to submit proposals for courses in the following three areas:
  - staff development in teaching methodologies,
  - development of management skills for all categories of staff,
  - updating knowledge and skills in technological, scientific and organisational fields.

These training measures are backed by special interrelated initiatives. This occurs in Sweden under the ITiS initiative which offers training to 70 000 teachers (around half of the teachers in primary and upper secondary education) thus bolstering the impact of training. All of them receive a free computer which they keep for their own use when training is over. To boost the effectiveness of training in the United Kingdom (England, Wales and Northern Ireland), a number of schemes have been introduced to provide subsidised or, in some cases, free personal computers to eligible teachers and headteachers. Another way in which the United Kingdom is boosting the impact of training is by coordinating its provision with the provision of computer equipment, facilities and services.

Alongside – or instead of – standard training programmes, there are more flexible and innovative arrangements, the purpose of which is to make teachers more aware of how they can incorporate ICT into their activity, or to provide them with training or support in this respect. Electronic networks transmit products, educational services and self-training tools and provide for the exchange among peers of experience and good practice. Among the many countries that have invested in the establishment of this kind of network (see above reference to the pro-

vision of equipment and facilities), France, the Netherlands, Sweden, the United Kingdom and Iceland have done so to a particularly marked degree. The *European Schoolnet* ([15]) is a further example of this kind of initiative at European level.

Other multimedia resources are sometimes available to teachers for training purposes. They include special on-line software and learning centres or continuing education centres such as those established in Greece and, more particularly, Iceland and Sweden. As part of a wide-ranging operation involving different sectors to boost the information society, Spain has launched a series of actions to train primary and secondary schoolteachers in use of the Internet, HTML and new technologies. In Greece, a database has been established to meet the ICT requirements of teachers and trainers. Austria is developing partnerships with firms in the advanced technology sector and setting up many e-Learning academies to provide special ICT training for teachers. A CD-ROM called *E-Fit, Österreichs Lehrer in das Internet* (E-Fit, making Austrian teachers aware of the Internet era) offers introductory assistance to all those who have not yet worked with the Internet during their courses. The Netherlands is offering a flexible method of continuous training that makes use of distance training software, training centres, computer laboratories, networks and similar facilities.

The training and availability in schools of one or several ICT resource persons, coordinators or specialists is another complementary approach to standard teacher training. These resource persons, who in most cases are themselves teachers, are trained to the highest level in ICT. Their role is to advise and offer informal training to their colleagues, encourage them to include ICT in their teaching, and support them and act as experts in managing computer networks and overcoming complex problems. Arrangements of this kind exist in Greece, France, Finland, Iceland, the Czech Republic, Latvia, Lithuania and Malta.

By contrast, very few countries report on training for the benefit of non-teaching staff. Where it exists, it is for school heads or librarians (as in the Netherlands, the United Kingdom, Estonia and Lithuania). Malta trains primary and secondary schoolteachers in ICT in a variety of ways, as well as providing ICT training for school heads and administrative staff in secondary education.

Public/private partnerships are sometimes established to train teachers. In Germany, 120,000 teachers have already been trained on a course developed with Intel. Private partnerships are also involved in teacher training in France and Italy.

([15]) http://www.eun.org

3 The inclusion of ICT in courses

ICT is almost a universal feature of primary and secondary school courses, both as a school subject and a teaching resource ([1]).

For example, as part of its effort to incorporate ICT more effectively into education, France has introduced measures for the use of ICT in all subjects in new curricula for *collèges*. The recently devised *brevet informatique* (computer science and Internet certificate) will soon be a means of testing the skills of all final-year *collège* pupils in the practical use of multimedia tools. As part of *lycée* reform, teaching in ICT for first-year lycée pupils has been established since 1999, while ICT is also steadily increasing its foothold in courses in French, physics with chemistry and the earth and life sciences. In addition, France has a product labelling policy geared to the development of quality products.

Furthermore, in combined initiatives such as those in Germany and Italy, efforts to provide suitable equipment and facilities, train teachers, boost educational methodologies which make the most of the special features of ICT, and develop educational content are closely interrelated.

While inclusion of ICT in courses is a decisive factor, attention should be drawn to measures, such as the following, which further the effective practical application of these decisions:

- Certain initiatives involve schools in the production of content by asking them to analyse and formulate their requirements and decide what products they need. Schools then contribute to the development of the proposals selected. Luxembourg, the Netherlands and Slovakia *(Infovek)* adopt this kind of approach.

- In Austria, action is being undertaken to develop **on-line educational content**. The aim is to prepare and provide teachers and students with course materials and information about digitally-based training. Criteria for selecting and evaluating platforms or systems for managing learning are to be drawn up, first and foremost, for schools, universities and other higher education institutions. Educational content packages for individual learning are to be built up with the help of content providers. All educational content on the Internet (whether it can be consulted free of charge by anybody, or prior registration is required as in the case of apprenticeship courses) will be accessed via a single address by means of an Internet home page established before the end of 2002. Educational content pages will be regularly updated and teachers will be helped to use these resources in their courses. Educational content will be prepared by teachers on the electronic platforms of universities or firms so that each student can follow the con-

([1]) For further information, readers should consult the indicators provided by Eurydice in the 99/2000 edition of *Key Data in Education* (Chapter J) and a forthcoming update which will be available as a separate publication at the end of 2001, entitled *Basic Indicators on the Incorporation of ICT into European Education Systems: 2000/2001 Annual Report*.

tent of a course at any point in time (this measure applies in particular to remedial course examinations). Apprenticeship based on distance education will be introduced in training sectors where demand is especially high (as in the case of HTL/*Fachschule für EDV und Organisation* provision). In general, the best forms of good practice will be extensively promoted.

- In the United Kingdom, the government is investing heavily in a number of ICT initiatives. The **National Grid for Learning** (NGfL) refers both to an educational portal, or gateway website, and the programme for providing schools and other institutions with appropriate infrastructure. Its aims are:
  - to provide a national learning resource to help raise educational standards and, in particular, to meet the government's literacy and numeracy targets and improve the quality of life and Britain's international competitiveness;
  - to deliver high quality educational software and services to teachers, pupils and other learners through public/private partnerships;
  - to remove barriers to learning to ensure equality of access for all, including those in isolated rural areas, those with special educational needs or those in areas of urban deprivation;
  - to provide an information and learning resource for teachers to improve their ICT skills.

The provision of available content in digital form is undertaken in France, for example, to boost the use of ICT in courses. Furthermore, as part of French *lycée* reform, the production of suitable multimedia materials for courses goes hand in hand with their transmission to teachers and their use by pupils in their supervised individual activity. This initiative amounts to more than simply making computer resources available, since they correspond to the subjects being taught and provide support for pupils and teachers when using ICT for specific purposes.

The already mentioned moves to ensure that one or more ICT specialists can provide support to teachers would appear to encourage the thorough incorporation of ICT in the processes of teaching and learning. The same may be said of action to identify precisely the new general skills required by various groups of staff and the means by which they can be acquired. For example, the Netherlands has introduced additional measures to train school heads and mathematics and foreign languages teachers who, although they have technical training in ICT and on-line multimedia products at their disposal, have felt that in practice they lack the expertise to make use of ICT in their work.

4 *Specific supporting initiatives*

The French Community of Belgium, Denmark, Austria, Finland, Sweden, the United Kingdom, Hungary and Slovenia report that they have set up centres of expertise, or established centres or made arrangements for research and development to support and supplement efforts elsewhere to provide equipment and facilities, train teachers and develop educational content.

The aim of all such initiatives is to further the introduction of ICT into teaching and learning, even where action focuses on different fields such as the development and promotion of training (Belgium), the design and development of appropriate and effective software and multimedia products (Austria, the United Kingdom/Scotland and Slovenia), learning environments and the establishment of networks (Finland), distance education (*Distum* in Sweden), and the definition of strategies to boost a wide range of services and advisory facilities (Hungary).

- In the French Community of Belgium, the *Conseil de l'éducation aux médias* (CEM, or Council for Education in the Media) is responsible for including media education in initial and in-service training courses, establishing priorities for such education, and encouraging partnerships. The CEM organises symposia and day-long study initiatives on the use of multimedia in education, prepares training recommendations, conducts audits and publishes brochures to boost awareness of these matters among teachers.
- In Denmark, the *Learning Lab Denmark* is an independent research institute on learning and the development of resources in the public and private sectors which includes the whole question of ICT in its activities. In this respect, it aims to broaden the scope for action and extend public/private partnerships.
- In order to develop high quality learning environments and evaluate and improve appropriate models and strategies, Finland has launched a major research and development initiative intended to provide a multidisciplinary network for schools and universities. This will deliver guidance on network development, make proposals on how ICT can enhance schools, and encourage the development of international contacts and the market for educational products. The same initiative has also led to the establishment of a school specialising in research on learning environments.
- In Sweden, *Distum* supports distance education and is also a centre for advice and information on the contribution to it of ICT. *Distum* also administers and promotes technical and research projects.
- The Joint Information Systems Committee (JISC) in the United Kingdom promotes the innovative application and use of ICT in higher education and non-compulsory upper secondary education by providing vision and leadership and funding the network infrastructure. It helps institutions to create, administer and maintain managed learning environments. It also encourages the exchange of information and experience, especially at international level.
- In Slovenia, a research and development initiative has led to the establishment of five centres for research, development and innovation in faculties and schools. The same venture has also resulted in 20 major development projects a year for the production of educational software and educational materials on the Internet, and 100 smaller schemes for the production of educational content, also on the Internet. The initiative also supports involvement in international research.

The establishment or development of virtual distance education courses (Denmark, Spain, Finland, the United Kingdom and Norway) is another form of expanding initiative, for which there are two models. The first is the creation of virtual universities entirely based on this concept, while the second is the provision of on-line courses which have also been given in stan-

dard classroom form in conventional educational institutions. Finland also supports the development of virtual schools.

5 *Concluding observations*

The first finding from the analysis of the survey is that ICT is indeed present in the education systems of the EU and EFTA/EEA countries. And in some countries, it is not a misrepresentation to say it has become an integral part of systems. The situation in systems in the pre-accession countries is more contrasted. Unlike their past actions whose results were far from an unqualified success, their present initiatives appear to be yielding much better results. The values current in our society, the more conspicuous presence of ICT in daily life, the more effective coordination and consequences of action to provide equipment and facilities, training, services and resources in the field of education, as well as the positive impact of private promotional market investment, all account for this state of affairs. However, further quantitative and, above all, qualitative progress is still desirable. The devising and refinement of mechanisms to measure and assess ongoing developments is an area of activity that has to be sustained both nationally and at European level, with due regard for the ready comparability of data.

The second point to emerge is the prime importance of *communicative activity* in the inclusion of ICT in education systems. As the range of equipment and facilities available increasingly boosts the scope of aspects dependent on effective networking, many initiatives for the benefit of teachers are exploiting those aspects through, for example, personal e-mail addresses, training in the use of the Internet and other electronic communications, facilities for discussion or the sharing of practice among peers and easier database access. By comparison, projects which primarily reflect educational or teaching concerns, in terms of method or content, are far fewer in number. In order to enhance the specific role of ICT as a learning resource, further progress in this area will be necessary. Indeed, this has to occur if the specific advantages of ICT highlighted by many of those with a stake in the activities of education systems are to materialise. This applies, for example, to its potential for developing more autonomous and flexible processes, more proactive and committed attitudes to learning and greater cooperation among peers. The notion of a particular purpose underlying education is of crucial significance in this context and should be the focus of more intensive thought and discussion in the debate concerned with the basic skills required by contemporary society. This is not simply a question of including a good knowledge of ICT and proficiency in its practical use among the basic skills necessary, but of exploiting its special potential for the acquisition of other skills now regarded as essential (such as initiative, problem-solving and teamwork, etc.).

Whether the aim is to make ICT a more integral part of education systems wherever appropriate, improve measurement mechanisms (such as indicators and benchmarks, etc.), or intensify the debate on the basic skills and educational objectives in relation to which ICT is especially significant, European cooperation in this area appears not only ever more necessary but the focus of increasingly high hopes.

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Belgium

French Community

1 Aims and strategies

Two general aims

- The incorporation of ICT into compulsory education, which is regarded as a factor in boosting the economy, attaches priority to training young people in use of these new technologies.
- This concern is coupled with determination to develop a policy for equal opportunities ensuring that **all** pupils can secure access to ICT.

A general strategy

The incorporation of ICT into different subjects rather than introducing a special course in this field.

2 Sharing of responsibilities

Close collaboration between the Regions of Wallonia and Brussels

Since the February 1998 cooperation agreement, the Regions of Wallonia and Brussels have been working together to provide French Community schools with multimedia equipment. A monitoring committee established jointly with the Communities is supervising the satisfactory implementation of this programme.

In practice, each Region makes computer and telecommunications equipment available and sees to its maintenance for three years (also assuming responsibility for its insurance against theft, damage and deterioration).

The French Community is supervising the satisfactory incorporation of ICT into educational activity, including teacher training and arrangements for resource/contact persons ([1]), etc.

Independent management of schemes for provision of computer facilities

- In the Region of Wallonia, provision is managed by the Ministry of Technical Equipment and Transport (MET).
- In the Region of Brussels, the computer centre for the Region (CIRB) has been entrusted by the government with implementation of this programme.
- Coordination and monitoring of the schemes, *Projet cyber-écoles* ([2]) and *Plan multimédia*, ([3]) for the French Community is handled by the 'cyber school' unit (AGERS – service for general affairs, research and inter-network monitoring).

3 Public/private partnerships

There are not really any partnerships of this kind. However, the (solely public-sector) partnership with Belgacom ([4]), under which schools are offered preferential rates for Internet access via the *I-line* (see below) is definitely worthy of note.

([1]) Following the plan to provide ICT facilities to schools in the Region of Brussels, which was finalised between the Minister/President of the Region and the Minister/(lady) President of the French Community in September 1998, a **'resource person'** responsible for quality maintenance has to be appointed by each school.
([2]) For the Region of Wallonia.
([3]) For the Region of Brussels.
([4]) Belgacom is the leading supplier of global telecommunications facilities on the Belgian market. It is a public limited liability company.

4 *Major initiatives implemented by the French Community*

a) Primary and secondary levels

Since 1998, the French Community has implemented a scheme to provide all primary and secondary schools (which it administers or subsidises) with multimedia equipment.

a1) The scheme for multimedia equipment

Aims: provision of such equipment to schools which so wish.

Partners: the French Community working with the Regions of Wallonia and Brussels.

Target groups: primary and secondary schools.

Period: 1998-2001.

Progress to date: during the 1998/99 and 1999/2000 school years, all primary and secondary schools in Wallonia which wanted to obtain equipment were supplied with it, as were all secondary schools in the Region of Brussels in 1999. Its provision to primary schools in this Region began in the same year and is due for completion in 2001.

a2) Connecting to the Internet

Aims: while all secondary schools were able to secure free access to the Internet via the CTI (Information Processing Centre) (*) intranet network from September 1997, the real drive towards connection to the Internet has been based on the August 1998 agreement between the French Community and Belgacom, which seeks to provide 1665 schools with an *I-line* for two years at an annual cost (excluding tax) of EUR 496 (BEF 20 000), including installation of the line, licence fees, and the cost of communications on which there is no time limit.

Partners: the French Community and Belgacom.

Target groups: primary and secondary schools.

Period: since 1998.

Progress to date: the agreement was amended in April 2000 with a reduction in the cost of the *I-line* for schools (to EUR 245 instead of EUR 495) and an increase in the number of lines (over 560) available to schools.

Measures for promotion and implementation: until April 2000, out of a real annual cost estimated by Belgacom to be EUR 3 966 (BEF 160 000), the federal government contributed EUR 1 859 (BEF 75 000), and Belgacom EUR 1 611 (BEF 65 000), so that each school only had to pay EUR 496 (BEF 20 000).

a3) In-service teacher training

Aims: ICT teacher training financed or subsidised by the French Community (including training in handling computer tools, their applications for teaching purposes and the development of critical familiarity with ICT media) is managed by the administrative authority responsible for the school concerned. Courses are organised by two main operators, the non-profit-making association for the promotion of in-service training in non-denominational education (*) and the centre for training in computer science in secondary education (CeFIS) (*), respectively. In addition,

(*) From 2001, the CTI is no longer involved in the provision of Internet access.

(*) This operator is concerned with managing in-service training for teaching and auxiliary staff.

(*) Since 1981, this centre has provided teachers, as well as the educational community as a whole, with training and information related to the acquisition of key skills needed for fully effective use of software tools and a sound grasp of the essential principles of computer science.

each public sector of education (Community, provincial or municipal) is free to offer special training courses for its teachers.

Target groups: primary and secondary schoolteachers.

Progress to date: in 1999, schools administered by the French Community were offered over 70 days of training on use of the Internet in teaching, at a cost of over EUR 19 000.

Measures for promotion and implementation: the minister of basic education has earmarked a budget of EUR 168 567 (BEF 6.8 million) for the development of basic training in the new technologies. In secondary education, the French Community has awarded an annual EUR 3.96 million (BEF 160 million) for in-service teacher training.

b) Tertiary level

Decree of 12 December 2000 on the initial training of primary and lower secondary schoolteachers

Aims: incorporate new content into training including knowledge and teaching applications of ICT and ICT media. A 15-hour module will be devoted to this in the first year, while in the second and third years, the number of hours will be increased to 30. Future teachers will be supervised by technical and educational resource staff allocated to the various teaching departments.

Partners: education departments in the *hautes écoles* (non-university tertiary level institutions) and primary and secondary schools which have to seek as wide a variety of partners as possible.

Target groups: trainee primary and lower secondary schoolteachers.

Period: the decree will be implemented from September 2001.

c) ICT media/multimedia education

Aims: since 1995, the French Community (working through the Council for Education in the Media and three officially recognised resource centres) has introduced a scheme to provide education in the ICT media for all primary and secondary school staff.

The Council has been entrusted with establishing priorities in this area, incorporating media education into school curricula and initial and in-service training, and encouraging the necessary partnerships.

The main aim of the three resource centres is to devise and promote initial and in-service training initiatives. These centres are the Centre for Self-training and In-service Training for Education administered by the French Community (CAF); the Liège Audiovisual Centre for education administered by the provinces and municipalities; and the non-profit-making association, *Média animation*, in the case of grant-aided private education.

Partners: the French Community, the Council for Education in the Media (CEM) and the resource centres for education in the media.

Target groups: staff in primary and secondary education.

Progress to date: among its various actions to heighten awareness in this field, the CEM has in particular initiated several seminars and 'study days' on the topic of multimedia applied to education; it has also drafted recommendations on initial and in-service training, audited initial and in-service training experts and operators, and published brochures to raise awareness among teachers, etc.

Measures for promotion and implementation: the annual budget for the proposals (with the 2000 budget as base) is EUR 312 345 (BEF 12.6 million).

German-speaking Community

1 Aims and strategies

Since 1998, the German-speaking Community has been conducting a deliberate policy for the development of ICT.

Two main aims

This policy is focused on two main aims:

- action to develop ICT in schools;
- initiatives concerned with in-service training and with fully mobilising the energies of civil society.

2 Sharing of responsibilities

In order to rationalise its human and technical resources for bringing about innovation in ICT, the German-speaking Community concentrates on **joint action** involving **think tanks** convened by the different levels of authority depending on needs. One such is the working group of network administrators which includes representatives from the various ministerial secretariats, as well as the Community's computerisation department; another example is the informal committee responsible for supervising work carried out under the *Learnbox* project (see below).

Meanwhile, the school inspectorate is increasingly involved in thinking and discussion about ICT and will probably take over from the think tanks (when the issue of facilities is superseded by that of their profitable use for educational purposes).

3 Public/private partnerships

Partnerships are not easy because the German-speaking Community market is not a magnet for commercial producers of multimedia content.

Mention should nevertheless be made of the *Explorian* ([8]) initiative which might be supplemented by a German-language product (already available to the German-language market in Germany, Austria and Switzerland) if ongoing negotiations with those who devise French-language projects are successful.

4 Major initiatives implemented by the German-speaking Community

a) Connecting secondary schools in the German-speaking Community to the Internet

Aims: 1998 agreement between the German-speaking Community and Belgacom, which has sought to provide as many secondary schools as possible with an *I-line* (all schools in the Community are now connected).
Partners: the German-speaking Community and Belgacom.
Target groups: secondary schools.
Period: since 1998.

b) The *CyberMédia* initiative

Aims: provide schools that so wish with multimedia equipment and facilities.

([8]) This has involved as yet informal contacts between the public and private sectors and Belgacom for the purpose of developing already existent *OneLine* lines to reach all German-speaking countries.

Partners: the Wallonia and German-speaking regions.
Target groups: primary and secondary schools.
Period: since 1999.
Progress to date: in 2000, 13 upper secondary schools were provided with computer and multimedia equipment; primary schools received 300 computers.

c) Regular involvement in Netd@ys and opening of a *Learnbox* unit

Aims: the participation of the German-speaking Community in Netd@ys (1) is a means by which it can heighten general public awareness of the new technological challenges arising from ICT. During the Netd@ys in 2000, two teachers who assisted with the introduction of ICT in primary and secondary schools opened an interactive educational Internet website, known as *Learnbox*, which amongst other things includes databases providing for the exchange of practical information among all schools throughout the Community.

Flemish Community

1 *Aims and strategies*

General aims
- The acquisition and development of knowledge regarding ICT should constitute a new 'lifelong learning' process.
- Schools should make arrangements among themselves for 'lifelong learning' to become a reality and an opportunity open to everyone.

Specific aims
- The Flemish government is encouraging schools to include ICT in their curricula, emphasising the need to link learning about it to the subjects taught at school.
- At the same time, the Flemish government is attaching priority to the initial and in-service training of teachers, as well as to the needs of schools regarding their infrastructure for computerisation.

Five general strategies
- Providing schools with hardware and software equipment;
- familiarising them with changes in the field of computer science;
- training teachers in ICT;
- promoting projects for international cooperation in the field;
- fostering evaluation and research in ICT.

2 *Sharing of responsibilities*

At government level: the educational use of ICT is defined in terms of 'attainment targets' (the pursuit of quality in learning, attitudes and skills; curricular quality, etc.) which have to be achieved by the majority of pupils depending on their level and/or subjects. These aims are formulated by the academic service of the department of education and ratified by the Flemish parliament. The inspectorate is responsible for determining whether the targets have been met. In addition to these tasks, the government makes an active contribution in the area of basic multimedia facilities for schools (software packages, advisory services, etc.).

At the level of the various sectors: the schools administered by the Flemish Community, the denominational schools, etc. are responsible for the introduction of educa-

(1) The Netd@ys initiative is discussed briefly on p. 18 in Part 2 of Chapter I.

tional software, advisory and support services and courses.

3 Public/private partnerships

In addition to the setting up of a 'Task Force' by the department of finance to boost public/private partnerships, there are three main types of partnership:

a) The PC/KD Programme
This programme is supported by some 30 companies which are producers of hardware or software suppliers (such as Apple Benelux, Barcard cvba, Belgacom, Brutélé, Bull-Packard-Bell, Compaq Computer NV, Siemens Computers, Philips, etc.). Through their retailers, they offer discounts to schools equipping themselves with hardware and software under the Programme.

b) The *I-line*
In response to federal legislation entrusting Belgacom with the task of linking schools to the Internet at a reduced cost, this company has defined the *I-line* product.

c) The 'PC in the classroom' initiative
Collaboration between the department of education and the Flemish Economic Union which offers schools the means of acquiring computers at bargain prices, via ECO PC services ([10]).

([10]) The private company ECO PC services is specialised in refurbishing computer equipment for the benefit of educational institutions and non-governmental organisations (NGOs). It is supplied by big firms wishing to get rid of their run-down equipment and offers good cheap facilities to the foregoing institutions and NGOs.

4 Major initiatives implemented by the Flemish Community

a) Initiatives concerned with infrastructure

a1) The PC/KD programme
Aims: launched in 1998, this programme awards funds to provide classrooms with multimedia equipment (hardware, software, modems, etc.). The ultimate aim is that, by 2002, all schools in the Community should have one computer for every 10 pupils (in the 10-18 age-group).
Partners: the Flemish Community and several private partners in the computer equipment sector.
Target groups: primary and secondary schools.
Period: 1998-2002.
Progress to date: in August 1998, all primary schools in the Community received funding. Secondary schools have done so since 1999.
Measures for promotion and implementation: the estimated cost of the final phase of the initiative is EUR 64.5 million.

a2) The *I-line*
Aims: as in the case of the other Communities, there is an agreement between Belgacom and the Flemish Community for the provision of Internet access to schools on special terms. Schools are offered 24-hour-a-day use of the *I-line* for EUR 248 a year (including installation, communication and registration fee).
Partners: the Flemish Community and Belgacom.
Target groups: primary and secondary schools.
Period: 1998-2000. On 29 March 2000, the federal Ministry of Telecommunications granted an extension to this initiative,

emphasising the scope for moving from ISDN to ADSL technology.

a3) The Telenet *Pandora* initiative

Aims: Telenet, the operator providing for access to the Internet, has launched the *Pandora* initiative for schools. The annual cost (excluding tax) of EUR 496 primarily covers installation, communication expenses, support services and Internet access between 6 a.m. and 6 p.m., etc.

Partners: the Flemish Community and Telenet.

Target groups: primary and secondary schools.

a4) Initiatives to promote video-conferencing

Aims: the department of education offers financial assistance ([11]) to schools for video-conferencing facilities and associated training.

Partners: the Flemish Community and the *Landcommanderij Alden Biesen* cultural centre.

Target groups: primary and secondary schools.

b) Initiatives to familiarise pupils with ICT

b1) The educational software project for special education

Aims: the project has been initiated in pilot schools for the purpose of using educational software to teach pupils with handicaps or learning difficulties.

Partners: the Flemish Community and the Universities of Leuven and Ghent.

Target groups: pupils enrolled in special education.

Progress to date: the results of this project have been communicated to all schools and led to the *Terra Nova* project ([12]).

b2) The European Network of Innovative Schools (ENIS)

Aims: this network seeks to link up schools recognised for their experience in the area of ICT.

Partners: the Flemish Community and the *European Schoolnet*.

Target groups: all types of institution (for compulsory, vocational, higher and continuing education and teacher training, etc.). It should be noted that the majority of the ENIS projects (virtual school, Enis, *e*Schola and *myEurope*) are for teachers in compulsory education.

Progress to date: in 2000, 17 schools took part in the project.

b3) The *matrix* programme

Aims: under the Ghent IV agreements with the Netherlands, the Flemish Community has developed the *matrix* programme of educational database software for primary schools. The programme consists of a CD-ROM containing descriptions of Dutch-language educational software written by teachers, educators and experts. This software is free for primary schools.

Partners: the Flemish Community and the Netherlands.

Target groups: primary schools.

Progress to date: since 1999, software which is similar (but can be consulted on line) is available for secondary education, though solely for the general courses of lower secondary education (http://www.ond.vlaaderen.be/secundair_scholen/edusoft).

([11]) Each year, the education department earmarks a new budget for this initiative.

([12]) *Terra Nova* is a project for pupils and teachers in the fifth and sixth years of primary education and the first year of secondary education, which seeks to promote the use of ICT during school hours. For further details, see the Internet website: http://www.terranova.kuleuven.be.

c) Teacher training initiatives

c1) In-service teacher training

Aims: familiarise teachers with the new technologies by encouraging exchanges of expertise through computer networking.

Target groups: primary and secondary schoolteachers.

Measures for promotion and implementation: the Ministry of Education has awarded EUR 3.09 million (BEF 125 million), for the development of networks of regional expertise intended to promote international cooperation in training and technical assistance.

c2) Initial teacher training

Aims: in order to prepare future teachers for their new roles in the information society, a discussion about innovation has been initiated via the higher education Internet website, while the department of education is supporting innovative projects in higher education. The projects relate in particular to the following: the production of teaching materials and tests; the training of instructors in new educational technologies; the establishment of flexible and efficient educational infrastructures; the development of new educational methods and techniques; and the creation of databases geared to the development of educational materials.

Target groups: primary and secondary schoolteachers.

d) Initiatives to promote international cooperation projects

d1) OECD initiatives ([1])

Aims: a seminar on ICT (June 1998) attended by experts from 25 OECD member countries and European Commission representatives resulted in the decision to organise activities concerned with the following: quality criteria for educational software and multimedia; changes in the market for educational software and the potential for partnerships in this area; and research and evaluation of the impact of ICT in education.

Partners: 25 OECD member countries.

Period: 1998-2001.

Progress to date: for each of the foregoing areas of activity, working groups report on progress to the bodies of the OECD-CERI (Centre for Educational Research and Innovation).

d2) European Schoolnet

Aims: the *European Schoolnet* network was initiated following the informal meeting of the ministers of education in Amsterdam on 2-3 March 1997, and the proposal of the Swedish minister to set up a network of European schools under the Commission action plan, 'Learning in the Information Society'. The network enables schools in EU countries to communicate, test educational resources and services and invest in multilateral projects, etc. Thanks the network, an inventory of school needs in ICT can also be established.

Partners: the European Commission, ministers of education in EU countries, schools in those countries.

Target groups: schools in EU countries.

Progress to date: the network demonstrates that schools have a considerable need for clearly defined standards regarding educational software, configuration, networks, etc.

([1]) Organisation for Economic Cooperation and Development

LEOA

Denmark

1 Aims and strategies

General aims

- Provide all schools with reliable inexpensive connections;
- provide schools with an intranet;
- ensure there are enough computers to incorporate ICT into education;
- develop significant ICT-related content;
- make ICT a part of initial teacher training and awarding teachers an 'ICT driving licence' to formally certify their knowledge;
- adapt courses in accordance with ICT-driven changes;
- develop on-line courses to promote lifelong learning;
- improve coordination between research into ICT and education.

Strategies

The strategies for achieving these aims are contained in the **'ICT in the education system'** action plan initiated in 1998 (for 1998-2003) by the Danish Ministry of Education.

The action plan covers five areas of concern:

- the implications of ICT for pupils/students;
- teachers and ICT;
- areas of study and ICT;
- fair and flexible access to lifelong learning;
- coordination between research into ICT and education.

2 Sharing of responsibilities

The ***Folkeskolen*** (primary and lower secondary schools): the municipalities are responsible for the operational facilities of these schools, as well as for the recruitment and remuneration of their teachers. The Ministry of Education does no more than provide very general recommendations during the preparation of school curricula.

The ***Gymnasiet*** (upper secondary schools): the counties are responsible for these schools and exercise sole financial jurisdiction over them. In contrast to the situation in the *Folkeskolen*, the Ministry of Education supervises curricular aspects.

Institutions for vocational education: these institutions are independent but entirely state-financed. Each has its own board made up of employer/employee representatives from the local business community who are responsible for breaking down the enrolment-based state allocation to the institution. From 1997 to 2000, these institutions received EUR 10.07 million (DKK 75 million) for computer equipment and facilities, and were equipped to a high standard in 2001.

Higher education institutions: their situation in management and administrative terms is similar to that of the vocational education establishments, except that their boards have fewer representatives from the local business community. Their computer facilities, although less impressive than those of the vocational institutions, are undergoing significant development. A large proportion of student residences with their own networks offer students unlimited access to the Internet at a very cheap monthly rate.

3 Public/private partnerships

There are no public/private partnerships. Private companies may of course enter into agreements with educational institutions, but

one or more public-sector bodies invariably administer the funds. Only the *Learning Lab Denmark* initiative (see below), which has just limited room for manoeuvre financially, might possibly qualify for consideration as a public/private partnership.

4 *Major initiatives implemented*

a) General initiatives (contained in the ICT action plan)

a1) School connections

Aims: this initiative covers two aspects.
First, since 1994, the Ministry of Education has extended the range of the specialist education network, *Sektornet*, which in 2001 now covers all educational establishments. However, 25% of the *Folkeskolen* have not taken advantage of this availability although, via the *IT, media and the Folkeskole* project, they are connected to the other institutions (with free installation operations for a two-year period, but liability for communication expenses). Secondly, under the terms governing national subsidies for school Internet connections, the government obliges private schools themselves to fund the setting up of an intranet. This initiative has proved successful, as between 80 and 100% of these schools have Internet access.
Target groups: schools (all levels).
Period: 2000-2003.
Measures for promotion and implementation: around EUR 80.59 million (DKK 600 million) in all.

a2) Provision of schools with computer facilities

Aims: although the State has subsidised public-sector schools to assist them with the provision of computer facilities, the municipalities (in the case of the *Folkeskolen*) and the counties (in the case of the *Gymnasiet*) have been responsible for purchasing the equipment concerned.
Progress to date: in 1999, the *Folkeskolen* had one computer for, on average, 10.3 pupils, the Gymnasiet one computer for 6.6 pupils, and the vocational schools one computer for 2.6 pupils.

a3) Inclusion of ICT in initial teacher training

Aims: the 1998 Act on the training of *Folkeskole* teachers states that computer science is to be included in all subjects. Future teachers trained under the new Act will graduate from 2002 onwards. Training of those wishing to qualify as *Gymnasium* and vocational school teachers occurs when they have successfully completed their course for the Master's level *Candidatus* qualification. For teachers in higher education, computer skills are not required, although several universities have launched 'computer science' strategies calling for teacher proficiency in the field.
Progress to date: the initiative is too recent for it to be evaluated.
Measures for promotion and implementation: the 'ICT driving licence' held by 33% of *Folkeskole* teachers in 2001, as well as the more specific subject-oriented certificate which *Gymnasium* teachers may be awarded from the spring of 2001, are among the provisions for implementation of the initiative.

a4) Adapting school subjects to ICT

Aims: despite work by the Ministry of Education along these lines since 1997, the results have not been outstanding. However, the Ministry is expecting that the recently established Danish University of Educational Studies will be able to make a significant contribution in this area.

a5) The development of on-line courses

Aims: since 1990, distance provision has been formally defined as a method of teach-

ing and not an organisational procedure. Although the Ministry does not systematically record Internet courses, it acknowledges the growing similarity between classroom and distance teaching. This has prompted it to develop the virtual university (see below), particularly to compensate for the relative lack of higher education provision on the Internet.

Target groups: all citizens.

Measures for promotion and implementation: since 1996, the government has allocated EUR 2.01 million (DKK 15 million) to boost education on the Internet. Provision has been developed by UNI-C, a public-sector institution which runs *Sektornet* (see above) and online services. Since 2001, a EUR 45.67 million subsidy (DKK 340 million) has been awarded for a three-year period to the *IT, media and the Folkeskole* project.

a6) Promoting coordination between ICT research and teaching

Aims: since 1998, the Royal Danish School of Educational Sciences, the Danish Institute for Educational Research and the Centre for Technology-supported Learning have worked together in the field of educational research. The *Learning Lab Denmark* initiative has been set up within the Centre which is an independent institute of the Danish University of Educational Studies.

Partners: the Royal Danish School of Educational Sciences, the Danish Institute for Educational Research and the Centre for Technology-supported Learning.

b) Specific initiatives

b1) Denmark's virtual university

Aims: the university is a coordinating body for the Danish universities and higher education institutions. It is responsible for offering higher education programmes via Internet distance learning and intended, in the long term, to match the level of the best providers. One of the main aims of the initiative is to achieve a quality service enabling students and people active in the labour market to develop their skills on an ongoing basis. Another long-term aim is that the university gateway should become the best updated Danish site on the Internet for higher education distance learning, with access to Denmark's electronic research library and other administrative information resources and databases. The gateway is due to become operational in September 2001.

Partners: the Danish government, universities and institutions of higher education.

Target groups: students in higher education who would like to use distance education facilities for some or all of their course; people active in the labour market who require continuing education and training at a high level; public or private businesses in which continuing training is a significant aspect of their strategy for competitiveness and/or human resources policy; higher education institutions that provide the necessary materials for virtual learning in the distance university.

Measures for promotion and implementation: the virtual university was established with EUR 5.37 million (DKK 40 million) from the Danish government. Special conditions were drawn up. The university has to provide flexible Internet distance learning, transparency and consistency across its range of courses, course descriptions for would-be users to compare the different courses on offer, and support for distance education (involving possible cooperation with foreign universities) for the benefit of foreign students and firms. It is the responsibility of the individual educational institutions associated with the university to ensure quality requirements are met.

b2) The Learning Lab Denmark initiative

Aims: launched on 1 July 2000, *Learning Lab Denmark* is an independent institution of the Danish University of Educational Studies. It is first and foremost a research-based experimental body concerned with learning and the development of skills in (public-sector and private) businesses and educational institutions and organisations. Its aim is eventually to become an open research centre which carries out its activities throughout the country in cooperation with a number of different partners.

Partners: cooperation with educational institutions, researchers, consultants and teachers. *Learning Lab* experiments are carried out in a number of institutionally dependent consortia which engage in independent research management, while complying with certain specific guidelines.

Target groups: firms, institutions and educational organisations.

Period: 2000-2004.

Measures for promotion and implementation: the Danish government has contributed EUR 8.06 million (DKK 60 million) for a four-year period and an additional EUR 3.22 million (DKK 24 million) also spread over four years are expected, together with external funding.

Germany

1 Aims and strategies

General aims

- Encourage a responsible, critical and creative approach on the part of pupils and students;
- include ICT in the initial and in-service training of teachers;
- encourage partnerships between multimedia centres and the teacher training institutes in the *Länder*.

Strategies

- Measures relating to ICT facilities, content and teacher training have been introduced at both federal and *Land* level.
- New teaching theories and methods are central to certain curricula and educational directives and are subject to regular appraisal.
- Encouragement is given to improving the organisation and content of focused multidisciplinary work on educational and teaching-related aspects of the new media.
- Teachers regularly take steps to upgrade the qualifications acquired on completion of initial training.
- Special databases and gateways are provided to deliver information and link previously separate branches of in-service training (vocational and university in-service teacher training).
- A wide range of ICT distance courses, qualifications and training has been developed, and self-training on the Internet is encouraged.

2 Sharing of responsibilities

***Land* responsibilities**: the ministries of education and research in the *Länder* are responsible for the in-service training of their teachers (who are civil servants).

Municipal responsibilities: municipalities are generally responsible for the provision of ICT facilities in public-sector schools.

Federal government responsibilities: the federal authorities share responsibility with the *Länder* in areas concerned with tax law, literary and artistic property rights, rights relating to use of the Internet, distance education and the quality assurance of services and educational software. The federal government also provides financial assistance.

3 Public/private partnerships

Alongside public/private partnerships with local industry, there is a nation-wide effort (the D21 Initiative, 'Innovation and Jobs in the Information Society of the 21st Century' on which further information is given below) on the part of German industry to promote the use of ICT throughout society in general and the education system in particular. The industrial sector has helped to provide some 20 000 schools with ICT facilities.

Among the most significant partnerships are the following:

- the most impressive contribution comes from Deutsche Telekom which has provided all schools with free Internet access, as well as 20 000 computers;

- as a result of the INTEL (1) in-service teacher training programme known as 'Teaching for the Future' (INTEL is the patented name of the front-ranking world-wide microelectronics company), 120 000 teachers have been trained to use ICT both in the classroom and for distance purposes;
- an association (2) of over 120 firms in the information technology sector (which was launched by the Ministry of Education and Research and the Centre for Research and Information Technology) is helping to provide schools with computer-related infrastructure at preferential rates, while qualified staff from the same firms are offering schools a free consultancy service.

Mention should also be made of the establishment of media skills centres which, in order to promote action by public/private partnerships, are offering high quality international programmes for postgraduate qualifications, in close cooperation with foreign higher education institutions.

4 *Major initiatives implemented*

a) ***Anschluss statt Ausschluss. IT in der Bildung*** (The IT in education: communication rather than isolation' Action Programme)

Developed on the basis of the aims in the September 1999 action programme and measures in the EU eEurope and eLearning initiatives, the IT in education: communication rather than isolation' Action Programme constitutes the main federal government scheme concerned with the educational applications of ICT.

The initiative is seeking to develop new forms of distance education and educational software, and devise sector-oriented solutions for trade associations, and the crafts and other sectors reliant on a high proportion of labour. In several areas of federal administration, various models of distance education have been subsidised under numerous schemes for continuing education and training. Some of these initiatives are intended to supplement the reorganisation of training at the workplace and continuing training, in such a way that computer-assisted learning and training programmes are made compatible.

The federal government is making available EUR 715.80 million (DEM 1.4 billion) for the Programme, EUR 130.38 million (DEM 255 million) of which are being allocated to vocational training institutions so that they can expand their computer resources. A sum of EUR 66.47 million (DEM 130 million) is earmarked for the development of new forms of distance education.

The following are its main components:

a1) The 'Schools on line' Initiative

Aims: launched in1996, this initiative involving the federal government and Deutsche Telekom seeks to provide all schools with free Internet connections (including their installation and monitoring) until the end of 2001 (1).

Partners: the federal government and Deutsche Telekom.

(1) INTEL is involved in the D21 Initiative. For further details, see the Internet website: http://www.intel.de

(2) Further information may be accessed on http://www.marktplatz-fuer-schulen.de.

(1) The federal government plans to extend this initiative for an unspecified period beyond 2001.

Target groups: primary and secondary schools.
Period: 1996-2001.

a2) Support for the development of educational software

Aims: initiative launched by the federal Ministry for Education and Research and concerned with support for the development of educational software (4).
Partners: the federal Ministry for Education and Research and the Centre for Research and Information Technology.
Target groups: schools at all levels (including vocational training establishments).
Period: 2000-2004.
Measures for promotion and implementation: funding of EUR 255.64 million (DEM 500 million) for 2000-2004.

a3) Programme to modernise vocational education institutions

Aims: programme to modernise vocational education institutions, which is centred on the provision of ICT facilities and implemented by the federal Ministry for Education and Research.
Partners: Federal Institute for Vocational Training and various social partners.
Target groups: vocational education institutions.
Measures for promotion and implementation: EUR 130.38 million (DEM 255 million)

a4) Facilities for public libraries

Aims: secure Internet access for all public libraries, according priority to those with inadequate means.
Target groups: public libraries.
Progress to date: in 2000, half the libraries were connected to the Internet.

(4) Further information is available at: http://www.gmd.de/NMB/PT/NMB.html.

b) The D21 (5) Initiative (Innovation and Jobs in the Information Society of the 21st Century) adopted on 22 September 1999

b1) Actions supported by the federal Ministry for Education and Research

The federal Ministry for Education and Research is concerned with the following areas in particular:

- development of the *Lehrer-Online* website with a new priority called 'Women teachers and pupils go online' financed by the *Infoschul* measure;
- establishment of the *DFN-Verein* network for higher education and research institutions;
- promotion of three Internet teaching projects for which the Ministry is awarding EUR 56.24 million (DEM 110 million) for five years: the first involves the establishment of virtual cooperation among *Fachhochschulen* (6), the second concerns the development of multimedia support for courses in chemistry, and the third has to do with technical and organisational approaches to 'telelearning' in centres for continuing training;
- support for various types of industrial pilot project involving companies, institutions and teachers, etc.

b2) Actions supported by the federal Ministry for Economic Affairs and Technology

The federal Ministry for Economic Affairs and Technology is concerned with the following areas in particular:

- promotion of the 'LERNET-web-based learning in SMEs and public administrations' competition, the aim of which is to

(5) Further information at: http://www.initiatived21.de
(6) Universities of Applied Sciences (ISCED 97 level 5A)

promote examples of good practice as regards the infrastructure for Internet-based training in the private sector or public administration. The ministry offers financial support to the ten best projects and assists with their implementation;
- joint adoption of new training regulations with the Ministry for Education and Research.

c) Joint actions involving the federal government and the *Länder*

c1) 'Construction of institutions of higher education' joint action

Aims: this initiative, which aims to support the programme for providing computer facilities, the establishment of communications networks in higher education institutions, and the extension of opportunities for training in computer science, has involved collaboration between the federal government and the *Länder* for some years.

Measures for promotion and implementation: in 2000, the federal government and the *Länder* allocated EUR 83.34 million (DEM 163 million) under the 29th framework plan for university construction.

c2) Joint actions for distance education

Aims: the federal government and the *Länder* have worked out several joint actions for distance education, for which they are earmarking EUR 5.11 million (DEM 10 million) annually, and whose main common feature is the use of computer networks and multimedia content in education.

Measures for promotion and implementation: the federal government and the *Länder* earmarked EUR 122.71 million (DEM 240 million) to help higher education institutions develop the extensive use of ICT from 1996 to 2000.

c3) The SEMIK pilot project (Systematic incorporation of media and ICT in teaching and learning processes)

Aims: the initiative was one of several pilot projects concerned with 'new information and communication technologies in the education system', which were launched as far back as 1983 by the federal authorities and the *Länder* via the *Bund-Länder* Commission for the establishment of training objectives and the promotion of research (BLK). The SEMIK project begun in 1998 aims to ensure the continued introduction and use of ICT in all schools. The main objectives of the programme are initial and in-service teacher training, the development of schools as well as of educational concepts and school curricula, and the provision of technological tools.

Target groups: schools at all levels.

Progress to date: the project is being rigorously monitored and its results made available to all schools.

d) Initiatives of the *Länder*

See the Internet website
http://www.bildungsserver.de

Greece

1 Aims and strategies

The Greek Ministry for Education and Religious Affairs has launched an **'Operational Programme for the Information Society'** for the period 2000-2006 which extends previous initiatives such as the 1996-2000 *Odysseia* action (1), and complements its general measures for providing schools with equipment and facilities, linking them in a network and developing ICT in education.

Two general aims

The plan has two general aims:

- offer a service and better quality of living to citizens;
- contribute to general economic and human resources development.

Strategies

- Providing a network of all primary, secondary and special needs schools and administrative units with ICT facilities, including hardware and suitable audio-visual equipment;
- finalising and modernising the national network on education (EduNet), as well as its infrastructure and services, so that all schools can access the network by the end of 2001, and installing an intranet linking all schools by 2006;
- ensuring rapid Internet access to teachers and pupils, and continuing to improve the Greek University Network (GUNet) and the higher education network management centres;
- setting up and/or modernising 'computer laboratories' (2) in tertiary education;
- increasing the establishment of public information centres via a network for young people in various sectors of society;
- undertaking expenditure on the eLearning infrastructure, under a plan covering the whole education system.

It should be noted that the general measures of the Ministry of Education also attach importance to introducing ICT into special needs education.

2 Sharing of responsibilities

a) In relation to administrative duties

As regards the **planning** of education policies, the Pedagogical Institute (3) is jointly responsible with the ministerial departments concerned for primary and secondary education.

Implemention and **monitoring** of programmes are carried out by the departments of primary and secondary education in the Ministry. Four additional bodies are involved in this task as far as implementation of

(1) Part of the Working Programme on 'Education and Initial Vocational Training', the *Odysseia* action itself consists of 19 programmes. Its aim is to include ICT in the daily activities of over 380 secondary schools. The Ministry of Education, the Pedagogical Institute and the Institute of Computer Technology are responsible for implementing the programmes concerned.

(2) Rooms with computer equipment in which working group activity is organised.

(3) A consultative body of the Ministry of Education responsible for research concerned with the primary and secondary levels of education and drawing up educational policy proposals. The Institute is also responsible for curricular development and the drafting of school textbooks that it revises in accordance with annual reports submitted to it by its educational advisers.

Information Society projects is concerned, together with university units, Technical Education Institutes and the Institute of Computer Technology (CTI). They are:

- the Implementation of Educational Projects Department of the Ministry of Education (DIEFES);
- the Organisation for the Building of Schools (OSK);
- the National Youth Institute (NEI);
- the Pedagogical Institute (PI).

Projects calling for **short-term** financial adjustment are jointly implemented by schools and local authorities.

a) In relation to 'products'

As regards **hardware**, the Ministry of Education, fixes standards which are then approved by the PI. The OSK, the DIEFES or the CTI submit calls for tender. The PI supplies **teaching equipment and materials** and establishes their standards.

Educational software used in schools is developed, either following calls for tender or by universities or institutes working in partnership with high tech companies.

3 *Public/private partnerships*

The Ministry of Education (the Directorates of studies for primary and secondary education), together with the PI and the CTI have formed a partnership with the National Telecommunications Organisation (OTE) to support the development of a high capacity network. The Ministry has also mobilised significant social resources comprising 69 university units and 19 research institutes and museums (in the *Odysseia* action, 1996).

4 *Major initiatives implemented*

Notwithstanding the fact that, at all levels of education, all national initiatives are concerned with the supply of hardware, the development and assessment of educational software and the training of teachers and other educational staff, special actions have been launched at each individual level.

a) Primary education: the *Island of Phaeakes* Programme

Aims: initiated under the 'Educational and Initial Vocational Training Programme' (which is covered by the *Odysseia* action), the 'Island of Phaeakes' Programme has sought to provide 14 pilot public-sector schools with computerised laboratories which are linked to the Internet and incorporate new educational software. Together with the information society programme (see above), this programme has been extended to include the establishment of a database to meet the needs of teachers and trainee teachers. The aims of training are threefold: provide trainees with basic computer skills, incorporate the use of computer science in the educational process and increase familiarity with educational software and the way it is assessed. A special effort has also been made to equip primary schools with hardware. The (quantitative and qualitative) aims are to make one computer available for every 12 pupils by 2006, to incorporate ICT into the educational process and to lead pupils to acquire basic skills in the use of ICT.

Partners: the CTI, and the departments for the training of primary school teachers at the Universities of Athens, Thessaly and Crete have assumed responsibility for the entire programme (the supply of hardware, teacher

training and the production and evaluation of educational software).

Target groups: teachers and other staff in primary education

Period: 1998 until the end of the 2000/2001 school year.

b) Secondary education: modernisation of the infrastructure and services of the national education network

Under the 1996-2000 *Odysseia* action, the Directorate of Studies for Secondary Education of the Ministry, the PI and the CTI have equipped 400 high schools with computer laboratories since 1997. New educational software for the teaching of all subjects in junior high school has also been produced and the CTI has localized international educational software.

Aims: launched in April 1999, this initiative seeks to ensure that all schools will be able to access the network by the end of 2001, and to link them up by means of an Intranet by 2006. The project will be complete when all 51 prefectures in the country are connected, along with 1 800 schools and 117 administrative units.

Partners: the Ministry of Education, the PI, the CTI and private partners.

Target groups: teachers and administrative staff in secondary education.

Period: 2000-2006.

Progress to date: at the end of 2000, the network already included 29 prefectures, 1 229 schools, 30 secondary education departments and 37 administrative units.

Measures for promotion and implementation: three major activities underpin this initiative:

- Development or supply of educational software: the Ministry of Education is starting to produce educational software in partnership with similar projects in Greek, or foreign languages translated into Greek. At the same time, this measure is supporting the work of the Certification Office of the PI which authorises the educational software.
- Training teachers in ICT: the Ministry of Education is seeking to establish a flexible training system involving training centres, computer laboratories and the award of certificates on completion of training. The aim is to familiarise teachers (who are in training centres or classes, or involved in distance or independent learning) with the use of ICT in education. For this purpose, regional educational support centres *(Mokese)* will be set up, while financial support will be awarded to each teacher actively involved in the programme and the EduNet (*) network will secure access to the database.
- Strengthening of distance education: the Ministry of Education will encourage the development of new educational software and establish a mechanism for teacher training and the coordination of training activity.

c) Tertiary education

The major objective of making a **high-capacity network** available to students and teaching staff in universities – which has involved, in particular, the constant updating of the internal network, the provision of services to higher training institutes and the implementation of GU-Net (*) – has been achieved. Meanwhile, the Greek research and technological network (GrNET) set up in 1998 takes part in the ICT pilot programmes of the EU,

(*) This is a Panhellenic educational network launched in May 1999 by the Ministry of Education and co-financed by the European Commission. Its main aim is to link up educational and administrative units.

(*) Greek Universities Network.

namely Tftant (*) and Sequin (*), and the United States (Internet 2). Since 1999, 5 distance learning rooms have been set up, with 12 planned by the year 2006.

The open and distance university which offered just two pilot projects in 1998, now has 5 000 students aged over 23 who can access around 20 courses organised to meet their requirements. They are supervised by tutoring advisers, use materials specially devised to encourage involvement and interaction on their part, and receive support from counselling centres located in six different cities. In 2001, 10 000 students are expected.

d) Special education

Two types of initiative (at a total cost of EUR 2.5 million, half of which is for incorporating ICT) should be mentioned:

- there are plans to extend an already existing database primarily concerned with special education (for example, to centres for disabled children);
- provision of computer laboratories in schools for special education and the establishment of ten pilot pre-vocational laboratories (an initiative which will be extended).

It should be noted that a new law on special education adopted in March 2000 reiterates the aims of the foregoing initiatives, and also includes an announcement about a programme and school libraries to be adapted to ICT.

(*) A subsidiary programme in the Academic and Research Network Programme.

(*) An acronym for the quality service of independent networks. This project involves eight partners in seven countries and is cofinanced by the European Commission under the Information Society Technologies Programme. Sequin began for a 15-month period on 1 November 2000.

Spain

NB: As a result of the process of decentralisation, all 17 Autonomous Communities have exercised powers in education since 1 January 2000. Moreover, the 1983 law on university reform represented a considerable step forward in extending the autonomy of universities. As the now highly autonomous universities have developed their own policies for ICT, the information given below is solely concerned with pre-primary, primary, secondary and non-university tertiary levels of education.

1 Aims and strategies

General aim

Get citizens (in particular, teachers, pupils and their parents) to become involved in the Information and Communication Society, through a set of general and specific programmes.

More specific aim

Increase general familiarity with ICT in education (both as a helpful teaching resource, but also as an essential practical means to the successful implementation of education policies, for example through providing schools with access to educational resources and making it easier for them to communicate with the public authorities, etc.).

Main strategies

The main strategies for achieving these aims are as follows:

- providing all schools with the equipment and facilities for accessing ICT;
- developing Internet courses and training;
- using the Internet to develop a vast range of educational and cultural services;
- developing the production of educational and cultural content on line;
- developing interactive educational television in increasingly close association with the Internet;
- setting up an observatory and laboratory concerned with the educational applications of ICT, thereby supporting innovation and development in such applications;
- developing cooperation between Latin America and Europe in the area of ICT in education.

2 Sharing of responsibilities

The **Autonomous Communities** are responsible for supplying hardware and software to schools and the maintenance of their facilities, for training centres and the training of teachers in ICT and for the production of educational multimedia materials.

The **Ministry of Education, Culture and Sport** is responsible for the smooth development and uniform distribution of ICT in all the Autonomous Communities. Given that they now exercise powers in education, the Ministry and nine Communities have signed a cooperation agreement for the continued development of all ongoing projects and for stimulating new projects under Info XXI (see p. 58). The Autonomous Communities are responsible for expenditure, while the Ministry is in charge of implementing programmes via the *Centro Nacional de Información y Comunicación educativa* (CNICE) (1). This approach makes it possible

(1) For further details, see below.

to achieve economies of scale and to improve cooperation between the Autonomous Communities.

3 Public/private partnerships

The Ministry of Science and Technology offers **subsidies** (under the Programme to Promote Technical Research) for the production of educational software and the development of telematics in education. This assistance goes to companies, public bodies and non-profit-making associations.

The ***Retornos sociales***: the central government awards new patents to telecommunications operators subject to them financing ICT for educational purposes. An example is Amena (1) which will invest EUR 62.5 million up to 2004 in the above-mentioned programme.

4 Major initiatives implemented

Given the recent extension of powers exercised by the Autonomous Communities, most of the projects they administer represent the continuation (though to a varying extent) of those formerly initiated by the Ministry of Education.

The following three main kinds of initiative may be identified:

a) **The *Iniciativa Estratégica del Gobierno para el desarrollo de la Sociedad de la Información INFO XXI*** (Strategic Initiative of the Government for the Development of the Information Society)

Aims: the Info XXI project, which is an integral part of this initiative, was established in December 1999 by the Prime Minister. The project, which comprises a variety of programmes, aims to promote the incorporation of each administrative level and economic sector in the Information Society.

Partners: all ministries are represented in the *Comisión Interministerial de la Sociedad de la Información* coordinated by the Ministry of Science and Technology. Info XXI educational programmes are to be developed jointly with the Autonomous Communities (certain subsidiary programmes will however be implemented by the Ministry of Education, Culture and Sport).

Target groups: most economic sectors.

Period: 2000-2003 corresponding to a budget of EUR 2.5 billion, of which EUR 0.14 billion will be for three educational programmes (see below).

Progress to date: the Ministry of Education, Culture and Sport is responsible for coordinating the activities of the 17 Autonomous Communities (with nine of which it has already signed cooperation agreements). A survey on the impact of ICT in the education system has begun and its findings will be available in mid-2001.

Measures for promotion and implementation: Info XXI is structured around seven main areas of activity. The first is concerned with education and training and includes three programmes:

(1) Company specialising in the mobile phone sector. See the paragraph below headed 'development of infrastructure in rural areas: a private initiative similar to *Aldea Digital*'.

- *Las autopistas de la educación* aims to develop applications of computer science in education, as well as telematics infrastructures.
- *El conocimiento en el siglo XXI* seeks to produce and supply educational material (multimedia tools and interactive Internet websites) to support the first programme.
- *Los modernos ciudadanos* will develop online subsidiary training programmes, as well as educational and cultural services on the Internet. In its contribution to a broader approach (involving educational support to families, assistance with training, and the integration of immigrants, etc.), the emphasis will be on priority subjects of an educational nature (including civics, drug prevention, AIDS, etc.).

b) Initiatives concerned with the application of ICT in education, which have been implemented by the Ministry of Education, Culture and Sport under the *Programa de Nuevas Tecnologías de la Información* (PNTIC, or programme for the new information technologies), and are now being administered by the CNICE

In June 2000, the Minister of Education, Culture and Sport set up the CNICE for the purpose of fully incorporating the Spanish education system within the Information Society. Since 1986, major projects concerned with ICT in the education system have been developed by the PNTIC, which is now part of the CNICE. The most concrete CNICE initiatives correspond to the **three Info XXI educational programmes** referred to above. However, the Centre is also responsible for a variety of **initiatives concerned with ICT and with education**. These may be illustrated by the following **8 actions** which were initiated in 1996 by the PNTIC, and are by far the most significant of the group:

b1) The *Aldea Digital* programme

Aims: introducing new technologies into rural schools situated in sparsely populated areas. This programme involves supplementary initiatives, ranging from the provision of computer equipment and Internet access to the special training of teachers and assistance and maintenance services. Since December 2000, similar initiatives have been developed by each autonomous authority for education in areas in which *Aldea Digital* has not been implemented.

Target groups: schools with one to three classes containing 5-15 pupils of different ages.

Progress to date: since January 2000, the programme has been developed in more than 2 500 rural schools. Over 7 000 teachers and 70 000 pupils have been involved.

b2) The *Redes* Programme

Aims: equip schools with intranets in order to develop a technological culture of self-sufficiency within them. The programme also involves the implementation of supplementary initiatives similar to those of the *Aldea Digital* programme (teacher training, provision of facilities, etc.).

Target groups: members of the educational community (parents, pupils and teachers).

Measures for promotion and implementation: since 1996, the *Redes* programme has provided technological infrastructure at a cost of EUR 47.5 million.

b3) Production of education materials and equipment

Aims: make multimedia materials and equipment widely available (for teaching or self-teaching courses in different subjects).

Target groups: schools via the Internet gateway to education.

Measures for promotion and implementation: the PNTIC annually issues a EUR 186 000 call for tender (the biggest for multimedia tools in Spanish) for the provision of educational multimedia materials.

b4) The *Formación de Profesores a través de Internet* Programme (Teacher training over the Internet)

Aims: train teachers in the educational use of ICT, in eight basic learning packages (covering methodology on the use of the Internet, learning HTML, ICT, special training for teachers of mathematics and languages, etc.).

Target groups: primary and lower and upper secondary schoolteachers.

Progress to date: from 1996 to December 2000, the Ministry trained over 30 000 teachers in the use of ICT in schools.

b5) Construction of an Internet gateway to education and culture

Aims: inform anyone about the formal and informal educational content of the Internet, with a view to boosting independent learning.

Target groups: everyone.

b6) Access to Internet and electronic mail for teachers and schools

Aims: extension of free Internet access to all schools (in a follow-up to the PNTIC/CNICE project seeking to provide access to all interested teachers). The objective is to connect all schools in the short term.

Target groups: primary and secondary schools.

Progress to date: precise results are hard to provide given the considerable independence of the Autonomous Communities in this kind of project.

b7) The Aulas Hospitalarias Programme

Aims: enable children in hospital to benefit from a suitable educational environment and prevent them from feeling isolated.

Target groups: children who have been in hospital for a long time.

Progress to date: 29 big paediatric hospitals are taking part in this programme. Classrooms with computers, Internet access, video-conferencing facilities, suitable peripherals and special educational software have been provided. Specially trained teachers have devised their own educational software and form a virtual community on the CNICE Internet website.

b8) The *Aulas Mentor* Programme

Aims: promote independent learning via informal training on the Internet (40 sessions, 23 of them concerned with ICT) for the purpose of helping adults to develop socially and professionally. Sessions are supervised by teachers who reply to questions from students by e-mail.

Target groups: adults.

Progress to date: this programme which has a network of 140 classrooms linked to the Internet and over 300 on-line teachers trained more than 27 000 adults between 1996 and December 2000.

c) Development of infrastructure in rural areas: a private initiative similar to *Aldea Digital*

Aims: a private initiative on the part of the Amena company, which is similar to the *Aldea Digital* programme.

Partners: Amena and the Ministry of Education, Sport and Culture working jointly with the Autonomous Communities.

Target groups: schools in rural areas.

Period: 2000-2004.

Measures for promotion and implementation: EUR 62.5 million will be invested in equipping Spanish schools in rural areas.

Besides this specific initiative, a host of private initiatives (involving companies, school, parent and pupil associations and NGOs) are being implemented in Spain in the area of ICT for educational purposes; over 100 Internet websites have been established so far.

Generally speaking, all the foregoing programmes and initiatives **comply with the guidelines for eLearning and eEurope**, as well as those of the **EU Feira Summit Declaration.**

France

1 Aims and strategies

A twofold general aim

- Train all pupils to use computer tools in a critical frame of mind so that they become fully active citizens who are aware of the social and cultural implications of the boom in the new technologies.
- Ensure that the development of ICT in education contributes to modernisation of the latter.

To achieve these aims, a three-year **Government Action Programme to bring France into the Information Society** (PAGSI) was adopted in 1998 and has been supplemented by further priorities for the period 2000-2001 (1). The initiative concerns all teachers at all levels and embraces teacher training, the provision of schools with equipment and facilities and the creation of school networks, and the production and provision of appropriate content. Since the spring of 1998, tertiary education institutions have also received special assistance for the purpose of offering all students access to tools and information networks.

PAGSI has three specific aims:

a) Encourage a comprehensive educational approach which means:
- teaching with ICT;
- developing activity among pupils and students which involves use of multimedia;
- encouraging exchanges of information among teachers via the information network;
- giving priority to information and training for teachers and managers.

b) Develop a decentralised network: the establishment of Educnet which means:
- equipping and linking up all schools;
- achieving balanced well coordinated development;
- developing an active partnership with local authorities and industry.

c) Encourage the production and provision of educational and academic content for teaching purposes which means:
- supporting the educational multimedia industry;
- encouraging individual production;
- stimulating the distribution of resources.

2 Sharing of responsibilities

Three levels of decision-making may be distinguished:

National level: the technological directorate of the Ministry of Research draws up policy for technological development and innovation and supervises its implementation. One of its main responsibilities is to develop the use of ICT in the education system (including schools and tertiary institutions). The sub-directorate of educational technology and information and communication technology of the Ministry of Education is the focal point for the coordination of plans for developing educational technology.

The level of the *académie*: the *académie* (2) is the level primarily concerned with providing impetus and coordination for the development of ICT in education. This means coordination between the various levels of education and partnership with local and regional authori-

(1) Although the PAGSI is officially coming to an end in 2001, its action is being extended through the priorities of the inter-ministerial committee for the information society (CISI) which were outlined by Prime Minister Lionel Jospin on 10 July 2000.

(2) An *académie* is an administrative constituency peculiar to the Ministry of Education, which is organised into geographically decentralised departments, each run by a *recteur*. France is divided into 28 *académies* which, with few exceptions, correspond to its regional subdivisions.

ties, firms, and other administrative authorities and associations. The essential mechanism for providing this impetus is the three-year *académie* plan. Advisors on ICT for education monitor implementation of this plan.

The local authorities: partnership with the local authorities is not simply a matter of financing the necessary facilities. They are very closely involved in school activities through their representation on school governing bodies. In tertiary education, they contribute to the development of its institutions under the central government/regional plans. The national plan includes arrangements to facilitate financing by local authorities of schemes for providing schools with equipment and facilities. Furthermore, there have been many calls for proposals (such as one recently for the development of ICT in primary schools, which is contributing to the funding of multimedia educational projects in almost 5 000 schools).

3 Public/private partnerships

Achieving the aims of PAGSI has called for partnerships between the Ministry of Education and the private sector. Many framework agreements have been signed in the last three years:

- *Association Francophone des Utilisateurs de Linux et des Logiciels Libres* (AFUL) for the use of free software and the creation of school networks.
- *Société Alcatel* (1) for the experimental implementation of pilot projects that make use of 'high capacity' networks.
- *Société Apple Computer France* for heightening awareness of Internet and intranet technologies among teachers.
- *Groupe Bull*, in particular for the establishment of working environments geared to the development of applications in schools situated in ZEPs (*zones d'éducation prioritaires*, or priority education areas), and for devising, with the Ministry of Education, training products for teacher training centres.
- *Camif* (4) for research into the most suitable facilities and equipment for educational projects, support for the implementation of resource centres and the provision of quantitative and qualitative data on purchases.
- *Société Compaq France* for assistance in providing schools with equipment and facilities.
- *Société Digital* for assistance with training those who provide training on tools for communication and transmission on the Internet.
- *Société Hewlett-Packard France* for the provision of distance education and training programmes.
- *Société IBM* which, in particular, is developing projects with the Orléans-Tours *académie*.
- *Société Lotus Development France* for its support in the development of projects involving joint work on the Internet/Intranet.
- *Société Lyonnaise Communications* for developing ways to access the Internet using cable for educational purposes.
- *Société Microsoft France* for its support in the development of projects relying on Internet and Intranet technologies.

(1) The Alcatel group is a world leader in the telecommunications market and the Internet. Alcatel France employs over 36 000 staff in the fields of telecommunications, cables and components.

(4) A consumer cooperative, and the third-ranking French mail order firm.

- *La Poste* for its support in the development of projects relying on Internet and Intranet technologies, (such as the allocation of free e-mail addresses to all teachers).
- *France Télécom* (*).
- *Cegetel* (*).
- *Suez Lyonnaise des Eaux*.

4 *Major initiatives implemented*

Attention should be drawn to four kinds of initiative which have been implemented under the three-year *académie* plans (corresponding to the *académie* contribution to the educational component of PAGSI):

a) The provision of computers and Internet connections

Since 1998, national measures have encouraged increased provision of computers for schools. As a result, the average number of pupils per microcomputer in *collèges* fell from 17.5 in December 1998 to 14.6 in March 2000 and, in *lycées*, from 7.3 to 6 pupils in general *lycées*, and from 5.1 to 4.8 pupils in vocational *lycées*.

In primary education, provision increased from one microcomputer per school in 1998 to around one for every 30 pupils in 2000.

Internet access which was available to only 5% of all schools in 1998 rose to 35% of schools in March 2000. In its priorities for 2000/2001, the CISI is planning for the schools to be provided with Internet facilities and connections by the end of the 2000/2001 school year. The government is allocating EUR 9.91 million (FRF 65 million) for this purpose.

b) Educational applications of ICT

The general application of ICT for teaching purposes and the emergence of new approaches involving electronic networking are central to the concerns of PAGSI.

The main thrust of this Programme is the **principle of electronic networking**, the advantage of which is to contribute to the pooling of resources (by linking up the resources of documentary information centres throughout the world), the **dismantling of geographical and cultural enclaves** (e-mail and teleconferencing are used to break down the isolation of rural communities, or enable pupils within them to benefit from the same options as those who attend urban *collèges*) and the satisfaction of particular local needs as appropriate (enabling pupils who are exceptionally good at sport or in hospital or handicapped to maintain contact with the school environment). Three initiatives among the priorities for 2000/2001 reflect such concerns (though to a varying extent):

b1) ICT and reform of the *lycée*

Aims: this initiative which has paralleled the reform of the *lycée* (which came into effect at the start of the 2000 school year) focuses on two main objectives:

- As a supplement to the new curricula for pupils in the first year of the *lycée*, teachers have been provided with ICT documents for all relevant subject areas on the Educnet server. In the case of artistic subjects, a special gateway has been established on Educnet.

(*) A French telecommunications operator (telephone equipment and facilities, networks, mobile phones, radiopaging, Internet, Minitel and teleconferencing).
(*) The leading private telecommunications operator in France.

- The emphasis has been on the need for pupils in their first year at *lycée* to have access to similar computer facilities and acquire the same level of proficiency in working with them through the introduction (from 2000/2001 onwards) of *travaux personnels encadrés* (TPE, or supervised individual activity) directed to this end.

Target groups: pupils and teachers in upper secondary schools.

Measures for promotion and implementation: it is planned that the above-mentioned special ICT documents supplementing the new curricula should be made available during the 2000/2001 school year, so as to encourage experimentation followed by their general introduction from the 2001/2002 and 2002/2003 school years onwards.
For the TPE, EUR 18.2 million (FRF 120 million) have been earmarked for standardising computer facilities in documentary information centres.

b2) The computer science and Internet certificate

Aims: this certificate is intended to provide formal recognition of the extent to which pupils can use multimedia tools effectively.

Target groups: in the first instance, pupils in lower secondary education and then all pupils from primary to upper secondary education.

Measures for promotion and implementation: from 2000/2001, the computer science and Internet certificate is being introduced in all *collèges*, while its introduction in primary schools will be optional. In 2002/2003, it will be mandatorily extended to all schools.

b3) Measures for the schooling of handicapped pupils

Aims: improve the education and integration of handicapped children by means of special multimedia tools.

Target groups: handicapped pupils (irrespective of the particular handicap concerned).

Period: 2001-2003 (plan for enabling handicapped people to take part in normal life).

Measures for promotion and implementation: EUR 25.92 million (FRF 170 million) have been made available for the Ministry of Education to acquire teaching equipment and materials and specially adapted technical forms of support.

c) Availability of multimedia resources

With due regard for the need to encourage the production of teaching resources and the identification of high quality educational products, four initiatives have been launched (though the list is not exhaustive):

c1) Educnet, the website concerned with ICT in education

Aims: open since August 1998, this website offers a comprehensive service for teachers (covering current events, general policy, teaching practice and methods, discussion groups, etc.).

Target groups: teaching staff.

Progress to date: the website has attracted an increasing number of visitors (rising by 20% a month on average) since the start of the 1999/2000 school year.

Measures for promotion and implementation: during 2000/2001, Educnet is planning to make areas available for communication and the exchange of information, establish a database for serious research, strengthen exchanges with networks of *académies*, develop an interactive channel known as *Canal Educnet* and ensure that the website conforms to requirements for those whose eyesight is poor, etc.

c2) The Educasource website

Aims: offer teachers and trainers a platform for guidance by means of which they can identify basic on-line and off-line resources of educational and training interest, and the means to discuss them among themselves.

Target groups: teaching staff.

c3) A special label for products of recognised educational interest (introduced in June 1999)

In January 2001, over 340 programmes classified by subject area or field (such as plastic arts, biotechnology, library information resources, history/geography, languages, mathematics, etc.) had been awarded this label of recognition.

c4) The Programme for Digitisation of Teaching and Research (PNER)

Aims: in line with Ministry of Education incentives to digitise documents helpful for teaching purposes, this programme is tending to become a platform for developing and adapting software or multimedia services.

Target groups: teaching and research staff.

d) Teacher training

d1) National initiatives

First, a two-year emergency plan was launched from the start of the 1998/99 school year in order to concentrate part of initial teacher training in *Instituts Universitaires de Formation des Maîtres* (IUFM, or university institutes for teacher training) on ICT. In 2001, the Ministry of Education is renewing the plan for a further period through fresh four-year contracts with the 29 IUFM (7), at the same time calling for a shift in emphasis from training teachers in ICT (8) to training them in its educational applications (9). Secondly, priority has been attached to the need to develop in-service teacher training in ICT (10). It should also be noted that, besides training, reliance on 'resource persons' is becoming gradually more widespread. In each school, staff in this category have received more in-depth training and are thus able to assist their colleagues in their use of ICT in teaching.

d2) *Académie* initiatives

At *académie* level, teachers have been provided with self-training resources and facilities for on-line assistance, as they appear to be steadily assuming a new role involving them in the development of teaching resources and participation in local, *académie* or international exchange schemes.

e) Fresh initiatives in the priorities for 2000-2001

e1) Increasing the number of specialised branches for the training of ICT professionals

An Internet *école supérieure* ('school' for higher education) has been set up near Marseille and, since September 2000, has been offering 45 different kinds of *licence*

(7) As each IUFM has its own four-year contract with the Ministry, the precise contractual terms and obligations may vary from one IUFM to the next.

(8) This means training in which future teachers acquire knowledge and skills in the field of computer and multimedia techniques.

(9) In this case, the aim is to stimulate thought and discussion on ICT teaching applications among future teachers and trainers specialised in ICT.

(10) This is organised mainly by the *académies*. Training in ICT accounts for around one-third of all in-service teacher training resources.

professionnelle (vocational degree) (11) in computer science and multimedia. Meanwhile, it is expected that the number of graduates from institutions specifically for training in telecommunications will increase by 50% in five years.

e2) Establishment of a high capacity Internet network for research and education, known as Renater 3

This network will be operational in 2002 and have a capacity 16 times greater than that of its predecessor, Renater 2.

e3) Facilities and connections for university halls of residence

From the 2000/2001 school year, a scheme for connecting 150 000 student rooms in halls of residence to the Internet will be undertaken as part of the renovation of premises under the 'Universities of the Third Millennium' programme.

(11) The *licence professionnelle* was introduced from the start of the 2000/2001 academic year (when 195 possible areas of specialisation for this new qualification were established). Its courses last for a year (subject to any special educational provisions) and combine theoretical and final-stage practical components with learning about methods and tools, and training placements in firms or other occupational environments. Courses are offered as initial or in-service training, and based on an integrated approach involving both training institutions and the professional sectors concerned. A variety of training pathways have been devised to take account of the particular qualifications, experience and needs of students from different backgrounds. The *licence professionnelle* is awarded by universities, independently or in conjunction with other public bodies for higher education which have been formally recognised for this purpose by the Minister of Higher Education.

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Ireland

1 Aims and strategies

1.1. Primary and secondary level

General aims

Establishment of an infrastructure enabling:

- all primary and secondary school pupils to achieve computer literacy and equip themselves for involvement in the information society;
- all primary and secondary schoolteachers to develop and upgrade their skills and use ICT as a resource for teaching and learning.

(*Source: Schools IT 2000 – A policy Framework for the New Millennium*, covering the period 1998-2000)

Specific aims

- Enable primary and secondary schools to secure access to ICT training, curricular materials, advice and support, to provide all schools with multimedia computers connected to the Internet before 2000 (the target is 60 000 computers, or one per class), and to encourage them to develop technology plans consistent with school requirements;
- enable disadvantaged schools to secure rapid access to ICT resources;
- develop, promote and apply models to support the provision of lifelong learning in schools, in cooperation with libraries and other bodies and organisations.

Strategies

a) Establishment of partnerships:

- encourage schools to obtain computer and training equipment and materials over and above what is provided by the government;
- establishment of a Policy Advisory and Development Committee including partners from the field of education and social partners;
- ensure the availability of preferential terms for school access to the Internet and telecom providers.

b) Development of the professional skills of teachers through:

- analysis of training needs in ICT;
- organisation of an extensive forum to analyse initial and in-service training needs;
- support for the inclusion of ICT in teacher training in the colleges and schools of education;
- development of a comprehensive in-career ICT training programme;
- provision of opportunities for all teachers to develop such skills;
- provision of training and materials to departments of the inspectorate in order to develop its responsibility for counselling teachers about ICT, and assist with evaluating progress achieved during the *Schools IT 2000* project;
- facilitating the accreditation of training with professional bodies associated with ICT, the national authorities responsible for certification (Teastas, NCVA) and/or third level institutions;
- development of programmes concerned with the educational use of ICT at postgraduate level and inclusion of a module in all postgraduate teacher education programmes.

c) School level:

- provide advice and support directly to schools and facilitate curricular integration of ICT;
- establish an Internet-based information, support and dissemination facility, *Scoilnet* (1);
- update models of best practice in the use of ICT, in association with groups of pilot schools;

(1) *Scoilnet* is the Irish Education website and the Irish partner of the European network called the *European Schoolnet*. The *Scoilnet* site (http://www.scoilnet.ie/) offers educational services and materials for a variety of groups, including pupils, parents and teachers, and puts them in contact with each other.

- disseminate such models of good practice to all schools.

1.2. Technological sector: aims and strategies

- Modernise the third level technological education system
- Provide training and support for technological staff. Plans for National Student e-mail for life are at a pilot stage. Most Institutes of Technology have a policy of bringing their students to European Computer Driving Licence (ECDL) level by the end of year one of their studies. A number of training courses are also available to teaching staff in various areas of ICT usage. Examples of these courses include a Dublin Institute of Technology (DIT) Masters programme for academic staff entitled *Third Level Learning and Teaching* with, among other things, a certificate level course and on-line diploma modules. The certificate and diploma courses provide a foundation for Masters level research projects relating to ICT usage. These courses are also open to staff outside the DIT.
  The Cork Institute of Technology also conducts a Graduate Diploma and M.Sc. in Computing in Education for mainly second-level teachers. These courses have also been extended to run in the Institute of Technology, Tralee and the Limerick Institute of Technology, with some 60 graduates expected to qualify in 2001.
- Promote the collaboration and sharing of best practice in relation to ICT usage in the technological sector. This sector has established two special interest groups in relation to the enhancement of ICT usage in the sector. ITnet oversees ICT activities for the 13 Institutes of Technology. The DIT has also established a special interest group in on-line and flexible learning. This group is involved in case study presentations, guest speaker seminars and local website activities.
- Encourage and support cross-faculty and cross-institutional research projects. These projects encourage and support the use of ICT in teaching and learning, by working with staff encouraging them to develop project proposals and to obtain external funding for projects from sources such as the Socrates (Minerva) and Leonardo da Vinci EU programmes.
- Provide financial support to the technological sector for pilot projects in the ICT area. Funding for these activities comes from the Institutes' annual budgets. In addition, the Department of Education and Science has sanctioned in principle a pilot open and distance learning project. It is expected that this project will commence in 2001.
- Promote awareness of ICT usage in the technological sector through the provision of e-mail facilities to students, Internet access, computer facilities/workshops and pilot open and distance learning modules. Students in the technological sector have access to e-mail, internet access and computer facilities. A number of colleges such as the DIT also organise events like the Showcase in Teaching and Learning Innovations. Central Event Sessions are also organised in the DIT. These events are targeted towards specific technological needs as outlined in the Computer Assisted Assessment Day.

1.3. Higher education level: aims and strategies

- Modernise the third level university education system;
- provide training and support for university staff;

- promote the collaboration and sharing of best practice in relation to ICT usage in the sector;
- encourage and support cross-institutional research projects;
- provide financial support to the university sector for pilot projects in the ICT area;
- promote awareness of ICT usage in the university sector through the provision of e-mail facilities to students, internet access, computer facilities/workshops and pilot open and distance learning modules.

2 *Sharing of responsibilities*

The Department of Education and Science (DES) is responsible for educational policy as regards both curricula and integrating ICT into the education system.

As far as the implementation of decisions is concerned, the **National Council for Curriculum and Assessment (NCCA)** is responsible for the implementation of curricula and provides guidance on how ICT should be included in them. It also advises the DES in this particular area.

The **National Centre for Technology in Education (NCTE)** provides advice and guidance to schools about the infrastructure required to implement the *Schools IT 2000* project. It too advises the DES in this area.

In the **technological sector**, the purchase of hardware, software etc. is generally the responsibility of the **Computer Services Manager** (CSM) in each Institute, in order to ensure that the purchasing policy and development plan of each are consistent.

For teaching courses, course content and teaching methodology proposed by a Department/School in a particular Institute are approved internally by the **Academic Council of the Institute** and externally by the **National Council of Education Awards** (NCEA).

At higher education level, the Higher Education Authority (HEA) was given its statutory powers by the Higher Education Authority Act, 1971. It is a corporate body comprising a chairman and not more than 18 ordinary members, all of whom are appointed by the government on the recommendation of the Minister for Education and Science.

The functions of the HEA are to:
- further the development of higher education;
- assist in the co-ordination of state investment in higher education and preparing proposals for such investment;
- promote an appreciation of the value of higher education and research;
- promote the attainment of equality of opportunity in higher education;
- promote the democratisation of the structure of higher education.

Within its specific functions, the Authority advises the Minister on:
- the demand and need for higher education;
- legislative matters pertaining to institutions of higher education;
- the establishment of new institutions of higher education;
- the amounts of state financial provision, both current and capital which it recommends for higher education.

The Universities Act 1997 assigned specific functions to the Authority in relation to the universities' pursuit of the objectives set out

in the Act as regards strategic development plans, quality assurance procedures, equality policy and financial/personnel management.

The HEA also manages and coordinates the Programme for Research in Third Level Institutions – a EUR 634.87 million programme (IEP 500 million) to research capacity development in all higher education institutions.

3 Public/private partnerships

As part of the *Schools IT 2000* project, the Irish telecommunications company Eircom, in partnership with the DES, has supplied each primary and secondary school with the following: a telephone line providing Internet access; an Internet service; a ready-to-use multimedia computer connected to the Internet; and free internet dial-up access for five hours a week. It has also supplied 30 education centres with an ISDN connection and a network of 10 multimedia computers taking in the network for teacher training.

The Intel company, which signed an agreement with the DES in September 1999, has assumed responsibility, for at least three years, for the development, maintenance and operation of the *Scoilnet* network, the *Irish Education* website.

Many partnerships between the private and public sector have been formed under the *School Integration Project* (SIP) (1) to develop schemes for the use of ICT in teaching and learning.

In the technological sector, one of the significant large-scale public/private partnerships is the CISCO Network Academy. The Cork Institute of Technology is one of the regional academies and most of the other Institutes of Technology have local academies.

4 Major initiatives implemented

a) Development of technological infrastructure

Aims: increase the number of multimedia computers in schools.
Target groups: primary and secondary schools.
Period: 1998-2003.
Progress to date: the number of computers is now 31 000, corresponding to an increase of 65% since 1998, and all schools have been connected to the Internet.
Measures for promotion and implementation: financing the establishment of class computer networks, examining the national infrastructure for extending Internet access, and expanding facilities.

(1) The *Schools Integration Project* (SIP) is one of the major initiatives of the *Schools IT 2000* project. Its intention is to develop models of best practice. Pilot projects have been established in some 400 primary and secondary schools covering 80 district ICT projects testing out or developing ICT applications, pedagogies and resources. Schools work in partnership with the education centres, the community, industry, businesses and appropriate third level institutions to determine models of good practice for the use of ICT. Schools taking part in SIP were being selected by the NCTE and received resources to help them realise their project goals, including grant aid for hardware and software, release time for teachers and assistance with ICT from regional advisors and the NCTE National Coordinator. The project is currently in its evaluation phase prior to dissemination of data to the broader schools network. The SIP website is http://www.ncte.ie/sip.htm.

b) Development of the professional skills of teachers

Aims: develop the knowledge and skills of primary and secondary schoolteachers.
Target groups: primary and secondary schoolteachers.
Period: 1998-2003.
Progress to date: since 1998, 36 000 teachers (corresponding to 75%) have received basic training in ICT.
Measures for promotion and implementation: introduction of programmes; analysis of training needs for the introduction of ICT into teaching and learning; and the progressive incorporation of ICT training into initial teacher training.

c) Development of an infrastructure for guidance and support

Aims: develop an infrastructure for guidance and support.
Measures for promotion and implementation: the development of curricular innovations to enhance the use of ICT in the classroom; setting up a national network to advise and support schools with their plans for ICT and the use they make of it; establishment of a national framework to support the development of multimedia products and tools tailored to the Irish curriculum; and the dissemination of appropriate curricular resources in schools, including multimedia products and tools.

d) Initiatives in the technological sector

All the Institutes of Technology are linked through a Wide Area ATM Network (ITnet established in 1993) with access speeds varying from 4-10 MB/s depending on their size. The technological sector and the universities jointly access the Internet through HEAnet Network Operating Centre.

All full-time staff and students in the technological sector have Internet access. In 2000/2001, the Institutes of Technology are trialing the use of IP-TV and IP-VC (video conferencing) in open and distance learning. This provision of content and advanced services to the Institutes of Technology is a core policy of ITnet. ITnet is fully funded by the Department of Education and Science through the Cork Institute of Technology on behalf of all the Institutes.

e) Initiatives at higher education level

e1) Advanced Academic Telecommunications
The State is involved in supporting two separate projects in the area of advanced academic telecommunications. Both projects are managed for the State by HEAnet Ltd., established in 1983 as a collaborative endeavour between its member institutions and incorporated as a limited company in 1997. HEAnet delivers Internet connectivity and related services to third level institutions, including all the universities and Institutes of Technology and various other organisations including CMOD, Enterprise Ireland, the National Library and Teagasc.

- **National Backbone Project**
  Rapidly increasing demand for network access in third level institutions in recent years and the high costs of additional bandwith has led to rationing by some institutions of access to students. The National Backbone Project aims to improve the infrastructure available to HEAnet's member institutions, including access for colleges to the high-speed backbone and Network Operations Centre in Dublin. There are no international networking com-

ponents included in this project which is being funded by the DES over a three-year period (1999-2001) at an estimated total cost of EUR 7.11 million (IEP 5.6 million).

- **Next Generation Internet (NGI)**
  The government is committed under the National Development Plan (2000-2006) to supporting the development of enhanced Internet access in the third level education sector. The project aims to increase the speed and load-bearing capacity of Internet access for third level institutions to enable real-time collaboration with high speed international education and research networks. It is also envisaged that the project will enable the development of advanced network-based application research projects in Ireland. These include activities such as digital libraries, virtual laboratories and telemedicine. All third level institutions in Ireland see the availability of advanced networking and complementary applications as critical to their research and teaching programmes. Funding of EUR 2.66 million (IEP 2.1 million) for the project for the year 2000 was approved by the Information Society Fund Evaluation Team and provided through the Department of Public Enterprise. This Department will support the project from 2001 to 2006, with approximately EUR 6.35 million (IEP 5 million) in funding to be provided in 2001.

e2) Training of trainers

Under the Training of Trainers Programme, the Department of Education and Science provides a wide ranging programme for re-training for staff in first, second and third level education and training centres. The training provided is focused on identified needs at each level and varies widely in content, duration and mode of delivery, both within and between sectors.

In the university sector, the programme is managed and coordinated by the Higher Education Authority. Universities are invited to submit proposals for courses in the following three areas:

- staff development in teaching methodologies;
- development of management skills for all categories of staff;
- updating knowledge and skills in technological, scientific and organisational fields.

Within the first of these categories, a number of courses have been recommended for approval in the 2001 programme, which are of relevance in the context of e-learning. The relevant courses are set out in the table below.

Institution	Course
University College Dublin	• Web-based Teaching Support • Educational Technology and Telematics: the threats and opportunities facing academics
University College Cork	• Computer Assisted Teaching and Learning
National University of Ireland, Galway	• On-line Teaching Skills for University Teachers • Teach the Teachers how to build a Virtual Curriculum • Instructional Design in On-line Learning • Web-based Course Material • Using e-Learning to enhance Employee Training
National University of Ireland, Maynooth	• Proactive Teaching using IT.
Trinity College Dublin	• Web-based Technology for Teaching and Learning
University of Limerick	• Using E-mail Groups to build Communities in Large Classes • Computer-aided Educational Assessment • Understanding Computer-based Learning
Dublin City University	• Internet Mediated Learning in Higher Education • Bio-informatics and its Implementation by Computer and Web-based Delivery Approaches • Teaching and Learning through ICTs in Higher Education
St. Patrick's, Drumcondra	• Integrating Technology into Teaching: a technology-based workshop • ICT – Enhancing Learning at Primary Level
All Ireland Society for Higher Education	• Internet Mediated Learning

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Courses generally take place in the latter half of the year, have an average duration of 3 days and usually involve 15-25 people. It is intended that a further call for proposals will be issued in September 2001, with the intention of approving more courses in November.

e3) Targeted initiatives

The recurrent grant allocated to the HEA includes a provision for targeted funding for special initiatives. The targeted initiatives provide the opportunity for the universities and other HEA-funded institutions to work with the HEA in new developments in areas of identified strategic importance in higher education. In recognition of the importance of the use of technology in education, the HEA has recommended that a new targeted initiative be put in place to provide support for the development of institutional strategies and approaches which develop and support the use of technology in learning.

Italy

1 Aims and strategies

Aims

- Improve the quality of teaching and learning;
- enable students to acquire a sound grasp of ICT and use it in their work;
- train teachers to use ICT and apply it to their work;
- boost theoretical knowledge of ICT.

Main strategies

- Providing schools with appropriate infrastructure (targets: one computer for every 10 pupils and an increase in the allocation of peripherals and audio-visual technology; maintenance and annual renewal of 25% of the equipment by 2001; provision of schools with technical back-up from specialised teachers or outside experts);
- connecting all schools to the Internet (target: daily access of at least six hours for 250 days a year, with a bandwidth suitable for multimedia teaching applications);
- establishing networks and boosting services (objectives: cabling schools and setting up networks within each individual school; providing all schools with organised services so that they can also access the external network via a server or router, as well as an efficient phone link; providing teachers with services, course material and equipment for their own training; intensifying work already begun through the extensive pooling of experience and the development of teaching materials/equipment, resources and cooperation among schools);
- encouraging the development and use of educational multimedia products (objective: establish school and local software libraries for collective and/or individual use);
- incorporating the study of ICT into curricula (inclusion in other subject areas at all levels of education, and its introduction as a special compulsory subject during the first two years of secondary school) and explaining how ICT can be effectively integrated into each of the disciplines concerned;
- training and advising teachers (objective: providing training and advice on the use of ICT in education).

(Sources: Programme for the Development of Teaching Technology and Italian Action Plan for the Information Society)

2 Sharing of responsibilities

The **Ministry of Education** finances training in ICT and/or the provision of schools with computer equipment. While some of the resources go to the **regional and provincial authorities** for the establishment of service centres, as well as advisory or resource centres for the benefit of schools, another share is allocated directly to the **schools** or **research bodies** involved in carrying out pilot projects. From 2000/2001, schools will secure educational and administrative autonomy and be able to raise funds to improve their provision.

3 Public/private partnerships

The provision of schools with computer equipment and ICT, connecting them to the Internet and the development of computer network services have generated partnerships with the private sector: an agreement

with *Radiotelevisione Italiana* (RAI), has led to 5 000 schools being fitted with digital satellite dishes, while Internet providers are offering free subscriptions to schools and IBM is taking part in the 'Reinventing Education' initiative. Private outside bodies carry out a share of teacher training.

4 *Major initiatives implemented*

a) Programme for the development of teaching technology

Aims:
- train teachers;
- supply schools with multimedia equipment;
- connect schools to the Internet;
- set up networks and services for transmission.

Partners: ministerial programme implementation staff, schools, and private partners including RAI, computer equipment suppliers and Internet providers.

Target groups: teachers, pupils and students in primary and secondary (general, technical and vocational) education.

Period: 1997-2000.

Measures for promotion and implementation:
- establishment of multimedia premises/facilities for teachers;
- provision of 'multimedia literacy' courses for teachers;
- introduction and use of all kinds of ICT: computer, telematics and television technologies (schools with digital satellite dishes and listening centres for the provision of distance education courses);
- provision of multimedia facilities suitable for whole classes, premises fitted with a few multimedia work stations for group work, a single multimedia work station for media-supported teaching, or service centres;
- establishment of a link to the local network and/or Intranet services (when schools are linked by cable);
- free connection of schools to the Internet;
- development of network services for pupils and teachers.

Results: the programme is now at an end and its results are as follows:
- multimedia provision: the least advantaged schools (primary, lower secondary and upper secondary schools) have at least one computer for 50 pupils and, on average, one computer for 10 pupils, whereas the most advantaged schools (the technical and vocational establishments) have one computer for 10 pupils, while there are 250 000 multimedia work stations in all throughout the country;
- Internet connections: virtually all technical and vocational schools, 90% of upper secondary schools and 75% of lower secondary and primary schools are connected to the Internet.
- teacher training: 'ICT literacy' courses are provided in 13 000 schools, while further provision is the result of schools, inspectorates and external bodies acting on their own initiative; 450 000 teachers benefit from such provision.

b) *Progetto SeT* (Project SeT)

This is an initiative to support the implementation of the Italian Action Plan for the Information Society.

Aims:
- improve the mechanisms, structures and teaching provision of scientific and technological education;
- train teachers and offer them guidance, services and materials to support their activity;
- ensure that scientific and technological education is a matter of general interest

and involve research institutes, museums, bodies for the protection of health and the environment and the industrial sector in strategies for bringing ICT into education.

Target groups: pupils and teachers in primary and lower and upper secondary education.

Period and budget: 1999-2002, with EUR 7 230 (ITL 14 million) for each school selected (primary schools, lower secondary schools, or 'classical' and artistic upper secondary schools); EUR 2 066 (ITL 4 million) for each technical and/or vocational school.

Progress to date: 500 schools involved in 1999 (200 primary schools, 150 lower secondary schools and 150 upper secondary schools).

Measures for promotion and implementation:

- submission of projects by schools, including a plan for their teaching activity and a draft budget;
- examination, classification and financing of projects by programme technical support services, in the inspectorates;
- drafting of a report by the schools containing the following: programming and experimentation involving at least two units of work (1), teacher training activities, the acquisition and use of resources and collaborative network activity;
- analysis and exploitation of pilot projects.

c) ***Materiali per l'educazione scientifica e tecnologica*** (Facilities for Scientific and Technological Education)

Initiative to support implementation of the Italian Action Plan for the Information Society, in association with the 'SeT Project'.

Aims: provide equipment and resources for scientific and technological education.

Partners: schools, universities, research centres, and a committee of experts appointed at the *Istituto Nazionale di Documentazione per l'Innovazione e la Ricerca Educativa* (Indire, or the National Documentation Institute for Innovation and Research in Education, which was formerly the library for educational information resources in Florence).

Period and budget: the year 2000, with a total budget of EUR 1.03 million (ITL 2 billion), and funding for each selected project to an upper limit of EUR 51 646 (ITL 100 million).

Measures for promotion and implementation:

- calls for project proposals;
- project appraisal by the special expert committee (with regard for the originality and logical consistency of the content, the possibility of using it at several levels of education, the innovative value of the proposed methodologies and courses, and their ease of incorporation into normal school practice and multidisciplinary nature);
- distribution of funding in accordance with the following activities: the provision of facilities which can be directly used in teaching and relate to at least eight clearly defined units of work (1), production of a guide for teachers, the publication of products accessible on the Indire website, and computer network assistance to other schools for a year from the time the products are first available to them.

(1) A unit of work is a precise area of teaching activity specific to the subject areas identified in the curriculum (for example, 'learning how to multiply' might be considered a precise area or 'segment' corresponding to a 'unit of work' in the subject area of 'mathematics').

(1) See footnote 1.

d) ***100 progetti*** (100 projects)

Aims: The aims are the same as in the case of the 'Facilities for Scientific and Technological Education' initiative, although the projects are not concerned exclusively with scientific subject areas. Out of 100 projects funded, those in their final form are made available on the Indire website.

e) ***Alfabetizzazione scientifica*** (Scientific literacy)

Aims: arrange training and counselling for teachers, training activities for pupils and the production of multimedia equipment.
Target groups: teachers in primary and lower secondary schools.
Period: an ongoing project.
Measures for promotion and implementation: the 'problem-solving' technique involving groups of teachers, working groups on teaching methods and practice, and groups of pupils.

f) **SENIS**

Aims: project for action-oriented research and the production of teaching materials.
Target groups: teachers and pupils in lower secondary education.
Period: the project ended in 2000.
Measures for promotion and implementation: establishment of a telematics network and the sharing of work experience.

g) **LES**

Aims: establish a national school network supported by researchers in order to implement innovative teaching laboratories, and to produce and test new materials for use in schools.
Target groups: the entire school system.
Period: an ongoing project.

h) **LABTEC**

Aims: production of self-training materials in order to reinforce laboratory activities in scientific and technological education.
Target groups: teachers and pupils in the first two years of upper secondary school.
Period: an ongoing project.

i) **Capire si può** (The ability to understand)

Aims: validate and make available effective models for achieving national standards in science and mathematics curricula.
Target groups: pre-primary and primary schools.
Period: an ongoing project.

j) **Energy and how it is transformed**

Aims: produce network resources and services to train science and technology teachers.
Target groups: pupils aged 10-14.
Period: an ongoing project.

k) ***Servizio Documentazione Software Didattico*** (Information resources relating to software)

Aims: inform teachers about the availability, characteristics and purpose of software for teaching purposes, and train them to select appropriate products and plan suitable courses geared to different needs. It is planned to extend activities to include on-line provision.
Partners: there is an agreement linking the Ministry of Education and the Genoa Institute of Teaching Technology.
Target groups: teachers and operators.
Period: an ongoing initiative.

l) ***Centro formazione insegnanti*** (Centre for teacher training)

Aims: make use of ICT in education.
Target groups: teachers.
Period: an ongoing project.
Measures for promotion and implementation: setting up of a Teacher Development Centre.

m) ***Indagine OCSE sulle TIC*** (OECD survey on ICT)

Aims: an international survey to study the contribution of ICT to improving school administration and activity.
Target groups: decision-makers, teachers and others involved in school provision.
Period: an ongoing project.

n) ***Multimedialità in classe*** (Multimedia in the classroom)

Aims: experiment with innovative hardware materials and new methodologies (involving multimedia laboratories, networks, etc.) for remedial activities and individual study.
Target groups: teachers and pupils in upper secondary education.
Period: an ongoing project.

o) ***Osservatorio tecnologico*** (Technological observatory)

Aims: monitor and make available ICT-derived products (networks, services, software, good practice, etc.).
Target groups: teachers.
Period: an ongoing project.

p) ***Catalogo del sofware didattico*** (Catalogue of software for teaching purposes)

Aims: collect, classify and make available multimedia products.
Target groups: all levels of education.
Period: an ongoing project.

q) **Reinventing Education** [3]

Aims: boost contact and cooperation between schools and the community, promote good practice and develop the role of teachers.
Partners: networks of schools and IBM (which supplies computer facilities and back-up for teacher training).
Target groups: all levels of education.
Period: an ongoing project.

r) **Programme *PC per gli studenti*** (PCs for Students)

Aims: encourage families with young students enrolled in the first year of upper secondary school to buy a personal computer which conforms to required quality, safety and service standards, by making available interest-free loans of EUR 744 (ITL 1.44 million) repayable over a 24-month period.
Partners: presidency of the Council of Ministers and *Associazione Bancaria Italiana* (the Italian banking association).
Target groups: students in the first year of upper secondary school.
Period: 30 March to 30 June 2001.

(3) The original title of the Italian project is in English.

Luxembourg

1 Aims and strategies

In line with the Feira European Summit (1) encouraging the development of an information society in all EU countries, the Luxembourg Ministry of Education, Vocational Training and Sport has introduced a series of projects for general implementation from 2001/2002.

General aims

- Familiarise young Luxembourg citizens with ICT which is now an all-pervasive feature of society and encourage them to think critically about ICT;
- end the 'digital divide' between the 'initiated' and 'uninitiated' in computer science.

This means:

- ensuring that teachers at all levels of education are linked to computer networks;
- providing a pilot *lycée* (2) with portable computers for all pupils and teachers;
- establishing an infrastructure for open distance education (in particular with a view to lifelong learning).

Alongside these general aims are a number of specific aims for each level of education.

Specific aims

Primary level: general aims should be distinguished from those relating to teacher training.

These projects are concerned with:

- developing the ability of pupils to process information, communicate, be creative and become more independent;
- making primary education responsive to the needs of all children so that their individual requirements are effectively catered for.

In **teacher training**, at least 120 hours are devoted to ICT in the two years of initial training (during which trainees may produce a dissertation with a strong ICT focus, including a theoretical appraisal of learning and the potential contribution of ICT to it). In-service training is concentrating on making teachers more familiar with educational software and the exchange of information on educational practice, but also has a training/research dimension in a project on learning processes and teaching methods.

Secondary level: the aim is to make teachers more responsive to ICT and as far as possible ensure its curricular integration, given that modern multimedia tools are conducive to a multidisciplinary approach and encourage teachers to provide for learning that places greater emphasis on intellectual curiosity, independence and the ability of pupils to take charge of the process. To this end, both the Ministry of Culture, Higher Education and Research and the Ministry of Education encourage teachers to acquire the following three skill levels during in-service training:

- minimum skills (basic familiarity with commonly used software, and Internet research, etc.);
- acquisition of more advanced skills (ability to identify teaching situations to which ICT makes an effective contribution and be more familiar with its potential, etc.);
- acquisition of 'meta' ICT skills (know how to analyse data critically, respect legal norms, etc.).

(1) The European Council of 19-20 June 2000.
(2) If the results of the project are considered to have been worthwhile, all schools may eventually benefit from this provision.

Tertiary level

N.B.: since the law of 11 August 1996 on higher education reform, the Luxembourg University Centre and the Higher Technological Institute (IST) have management and educational autonomy. Both institutions offer training in the field of computer science.

IST is seeking to make as many computers and as much software available to students as possible, and to update its computer facilities.

2 *Sharing of responsibilities*

a) **Primary education**

- **Coordination and guidance regarding logistical support** to pre-primary and primary schools are provided by the Ministry of Education, Vocational Training and Sport.
- **Equipment and other facilities** are the responsibility of the local municipal authorities (the city of Luxembourg also arranges for logistical and educational support and activity).
- **Initial training** is the responsibility of the Ministry of Culture, Higher Education and Research. In-service training, in particular in ICT, is the responsibility of the Ministry of Education, Vocational Training and Sport.

b) **General and technical secondary education**

- The **Media 2000 Programme** (1) is run by a supervisory group of coordinators from the different departments of the Ministry of Education. Its Centre for Educational Technology (CTE) coordinates the logistics of the Programme, as well as its budget, while its Department for the Coordination of Research and Educational and Technological Innovation (Script) (2) is entrusted with project evaluation.
- **Initial training** is the responsibility of the Ministry of Culture, Higher Education and Research, whereas **in-service training** is coordinated by the Script.

c) **Tertiary education**

- Since reorganisation of the government in August 1999, a new ministry has been created, namely the **Ministry of Culture, Higher Education and Research** which is responsible for all matters concerned with tertiary education.
- Computer requirements are studied by each department working jointly with the government's information technology department which draws up plans for the budget and issues calls for tender.

3 *Public/private partnerships*

Early 2001 initiatives are being discussed with major equipment manufacturers and the department of postal services and telecommunications. For example, an initial experimental partnership between IST and Hewlett-Packard aimed at fitting out a room for computer projects is being developed.

Meanwhile, the Ministry of Culture, Higher Education and Research is studying jointly

(1) Programme for the provision of computer and multimedia equipment for the benefit of pupils in primary education, which is administered by the CTE. See below for further information.

(2) It should be noted that there is further information on these initiatives: http://www.script.men.lu/documentation/archiv

with foreign tertiary education institutions the setting up of a 'virtual' European university for the Greater Luxembourg-Sarre-Lorraine Region.

4 *Major initiatives implemented*

a) Primary education

a1) Multimedia Interface for Research and Learning (MIRA) Project

Aims: coordinated by the Script and launched at the start of 2000, this project aims to develop proficiency in the use of ICT among pupils (documentation and other classroom activities) and teachers (teaching practice, assessment, etc.).

Partners: Ministry of Education, local authorities, primary schools.

Target groups: primary school teachers and pupils

a2) Decoprim and Decolap Projects

Aims: projects launched in 1993 in order to identify practices likely to stimulate the development of oral and written skills among pupils in pre-primary and primary education, and to make use of ICT in language learning.

Partners: pre-primary and primary schools, local authorities and the Ministry of Education.

Target groups: teachers and pupils in pre-primary and primary education

Progress to date: TEO software has been successful. This is a kind of oral word-processor by means of which pupils in pre-primary school classes can record and reprocess what they have said using an oral support facility. It is planned to develop a version geared to novel operating systems.

b) Secondary education

b1) MEDIA 2000 Projects

Aims: these projects are intended to develop and implement action plans for computerising general and technical secondary schools so as significantly to increase their ICT facilities.

Partners: the projects have been carried out by the Centre for Educational Technology and are coordinated by senior officials in the secondary education department, the Script and the Luxembourg telematics network for education and research.

Target groups: pupils in general and technical secondary schools.

Progress to date: linking the project to an innovative concept stimulates teachers and is conducive to the use of new teaching methods.

Measures for promotion and implementation: the Luxembourg government has earmarked EUR 2.5 million for the MEDIA projects. Secondary schools submit innovative ICT proposals and, via the CTE, MEDIA 2000 provides the former with the facilities they need to carry the projects out. It is planned to monitor these initiatives and prepare documentary information on their evaluation.

b2) FranTic Project

Aims: in order to encourage the incorporation of ICT into the secondary education curriculum, this project (used in the teaching of French) seeks to bring the proficiency of all pupils in ICT up to the same level. The project has a twofold objective. On the one hand, the aim is to prepare appropriate content and, on the other, to train teachers to use ICT as a teaching resource.

Target groups: pupils in general and technical secondary schools, and teachers of French.

b3) Project to restructure the educational content of upper secondary education

Aims: this project sets out to include the use of ICT in the curriculum in such a way that pupils learning any subject acquire certain skills (in reading, writing, transmission of their own work) and become more actively involved and independent.

Target groups: pupils in general and technical secondary schools.

Measures for promotion and implementation: Special attention will be devoted to education in ICT media, so that pupils use media and multimedia as effectively as possible.

Netherlands

1 Aims and strategies

General aim

Modernise the entire education system and improving the quality of the education provided.

(Source: 1997 government plan: *Investeren in voorsprong* ('Investing in the Future'); Memorandum covering the 1999-2002 period: *Onderwijs on line* ('Education on line').

Specific aims

- Encourage innovative teaching and learning practice at all levels through the introduction of appropriate educational software;
- enable those involved in the education system (such as teachers and school heads) to acquire the necessary skills in ICT so that it can be effectively incorporated in the education system;
- ICT policy and emancipation; achieve equality of opportunity for all pupils irrespective of their sex, social and cultural background, ethnic origin or physical attributes in order to counter social inequality, while offering special support to children who suffer from language problems or physical handicaps, by using ICT to assist them with learning;
- extend the role of cultural institutions;
- intensify international cooperation.

Main strategies

- Strengthening the contribution of ICT to levels of education (primary and secondary education, adult education and training and teacher training);
- allocation of government funds for the incorporation of ICT into the education system;
- encouraging schools to determine themselves the most appropriate means of incorporating ICT (among the options, for example, are investment of resources in the in-service training of teachers, the development of new educational software or the recruitment of ICT coordinators and administrators), with the government setting the general objectives and ensuring that conditions are conducive to the satisfactory introduction of ICT into education;
- action in the following four areas: professional development, educational courses and software, infrastructure and the *Kennisnet* (Knowledge Net) network. Activities under these headings include training provision, connecting schools, colleges and universities to the Internet, construction and extension of networks, increasing the number of exchange initiatives, devising and promoting the use of new tools and methods, establishment of partnerships, production of products and services, provision of e-mail addresses for students and the establishment of digital universities.

2 Sharing of responsibilities

The **government** sets the general aims, ensures that conditions are suitable for the satisfactory introduction of ICT into the educational system and informs the parties involved of ongoing developments. It also makes a financial contribution to ICT in education (see 'budget' below). For example, the **Ministry of Education, Culture and Science** has encouraged the production of educational software by awarding resources to specialised centres of expertise, while attempting

to make them more widely known and broaden access to them.

Schools establish a plan setting out the means for including ICT in their provision. In addition, they themselves earmark the corresponding resources, for example for in-service teacher training or the purchase of educational software. They can acquire computers and software, provided they formally apply for them. The **inspectorate** ensures that expenditure is effective and action is directed towards the main aims.

3 *Public/private partnerships*

In the course of managing ICT infrastructure, schools form numerous partnerships with regional and local authorities, as well as firms.

Over 75 suppliers offer services and new content on the Kennisnet website. The Network also provides access to 200 websites distributing teaching materials developed, paid for and maintained by publishers. Many materials are also supplied by the *Thinkquest* network (').

4 *Major initiatives implemented*

The *Onderwijs on line* Memorandum, covering the 1999-2002 period, describes the major initiatives which are organised around the four areas of action concerned. Higher education constitutes a separate category.

(') Thinkquest is a website for a variety of target groups, which provides services and guidance to users in the field of education. It operates in liaison with the Kenniset and Surfnetnetworks. http://www.thinkquest.nl/zoeken.html

a) Professional development

Aims: enable teachers, school heads and others involved in education to acquire the expertise needed for the satisfactory incorporation of ICT into the education system. Notwithstanding the provision of training, school networks and research for the design and distribution of new tools and methods, around half of all teachers and many school heads consider their ICT skills are inadequate and require in-service training focused on ICT applications in educational activity.

Target groups: teachers, school heads and others involved in the education system.

Period: 1999-2002.

Measures for promotion and implementation:

- identification of new key skills and proposed measures for their acquisition in such a way that both general needs and the needs of specific groups, such as school heads, are satisfied;
- incentives for the provision and financing of training;
- appraisal of the skills acquired and the award of qualifications;
- funding.

b) Educational courses and software

Aims:

- the development of software for teaching suitable official courses and supporting innovative methods of teaching and learning;
- distribution of up-to-date information regarding the availability of software and its possible applications.

Target groups: primary and secondary schools.

Period: 1999-2002.

Measures for promotion and implementation:

- extending knowledge, ease of access and use of the tools already available;

- support for training and for the effort invested in sharing the knowledge and expertise acquired as a result of such new resources (establishment of a discussion area on software in the Kennisnet Network),
- involvement of schools and teachers in the development of innovative software;
- funding schools so that they can purchase software and developing real responsiveness to what they require.

Progress to date: in 2000, financial support went to 105 development projects and 200 projects for the construction of networks.

c) **Management of ICT – Infrastructure**

Aims: ensure that schools are responsible for their ICT infrastructure so that it is fully geared to established objectives.

Partners: schools, local and regional levels, firms.

Target groups: primary and secondary schools.

Period: 1999-2002.

Measures for promotion and implementation:

- ensuring schools are fully informed about possible facilities, planning and forms of cooperation;
- attempting to encourage schools, with the support of head teachers who are more fully trained, to draw up plans for incorporating ICT which are an integral part of the way schools are organised as a whole;
- making school management less onerous and providing for standard facilities;
- encouraging and supporting partnerships with local and regional authorities and firms for the establishment and management of infrastructure (development of a management vade mecum, preparation of a study on regional initiatives and a 'golden disc' to deal with malfunctioning, and joint effort by the ICT Directorate and six national school council associations for the setting up of a national *Stichting ICT op school* ('Foundation for ICT at school'),
- funding for maintenance.

d) ***Kennisnet*** (Knowledge Net)

Aims: provision of access of all schools to high quality services via *Kennisnet*. Among the features of this network are the following: it may be accessed by all groups or institutions connected with the educational sector; the *bandwidth* is sufficient for all pupils to consult multimedia electronic sources and make their own work available on line simultaneously or in groups; services are made rapidly available; clarity and transparency so that pupils and teachers can easily find educational material; security safeguards; possible use of e-mail addresses and the organisation of discussion groups providing for the extensive exchange of information. All schools and other educational institutions, libraries and museums will be linked to *Kennisnet* before the end of 2001.

Target groups: children, pupils, teachers, school heads, parents and educational institutions, libraries and museums.

Period: 1999-2002.

Measures for promotion and implementation:

- connection of all schools to the Internet before the end of 2001;
- extension of the gateway website: addition of an examination section, a search engine and a *News for Young People* section;
- extension of the network and services: addition of 17 new networks, new services and content provided by 75 suppliers;
- making available 200 electronic websites on which the network transmits teaching methods (with the sites developed, paid for and maintained by the publishers which produce this material);

- access to the website free of charge (for pupils and teachers) and with a charge (for other users);
- financing (EUR 1.36 for each connection to the network and EUR 11.3 per pupil to cover use of the system);
- distribution of a brochure on the introduction and use of ICT in schools.

e) Higher education

Aims: ensure that conditions are such that higher education institutions can determine what policies to follow as regards ICT (Higher Education and Research Plan, or HOOP).

Target groups: universities, with EUR 16.8 million for the financing of risk projects in 1999/2000.

Measures for promotion and implementation:

- increasing the availability of digital teaching materials, raising the level of expertise among teachers and improved planning for the incorporation of ICT in education;
- improving the national higher education network *Surfnet* (1) which is part of the GigaPort project;
- establishment of a digital university by 12 higher education institutions.

Progress to date: this is the level of education at which understanding of the use of ICT is most advanced (applications of standards, use of e-mail, and the excellent quality *Surfnet* network).

Budget

Government budgets for investment in ICT have been increased regularly since 1998, but until now these increases have not been of a permanent, structural nature. The figures in Table 1 represent only the structural budgets. Structural increases have been claimed as from the year 2001.

Table 1

Total budgets for ICT investments (in millions of euros)

	2000	2001	2002	2003	2004	2005
EUR	348	295	272	212	212	212

Table 2

Breakdown of budgets (Table 1) for 2000 and 2001 (in millions of euros)

	2000	2001
1. To school budgets	289.1	189.2
2. Professional development	1.4	2.3
3. Development of software and methods	8.6	12.3
4. Technical management	2.3	3.2
5. *Kennisnet*	43.6	82.1
6. Other projects	2.7	5.9

(1) Surfnet is the national electronic network of higher education and research institutions. It links up many institutions throughout the country and is also connected to other European and international networks. http://www.surfnet.nl/en/surfnet-organisation/

These figures concern only the extra money budgeted by the Ministry of Education, Culture and Science. They do not include money spent by schools from their existing budgets, expenditure by local authorities, or investment by publishers and other companies in the development of software, etc.

It should be noted that the budgets transferred to schools are not earmarked. They are added to the regular budgets of schools which themselves decide on their allocation. In practice, most schools spend (considerably) more than these extra sums on ICT.

The school budgets are intended for hardware, software, professional development, staff, technical management and any other school expenditure on ICT. The figures in Table 2 (corresponding to 2, 3, 4 and 6) are sums spent on developmental and other projects. Expenditure arising from (for example) the professional development of teachers at a particular school comes from that school's budget.

Austria

1 Aims and strategies

Two general aims

- Promote effective, long-lasting and systematic implementation of ICT in the areas of education, science and culture;
- introduce the e-Learning concept into academies, universities and adult education and training, as well as in learning on the network, the training of future teachers, and within society as a whole.

A general strategy

The aim of the ICT strategy of the Ministry of Education is that e-Learning and the Internet should become natural learning resources. These aims are reflected in eight priority projects:

- establishment of e-Learning academies (1);
- extending opportunities for training in ICT;
- developing on-line teaching content/educational gateways;
- setting up ICT scientific centres;
- enriching adult education and training;
- promoting the Austrian cultural heritage over the Internet;
- launching 'e-Government' in education;
- adapting the infrastructure.

2 Sharing of responsibilities

Compulsory general schools comprising primary schools, general secondary schools (*Hauptschule*) and pre-vocational schools (*Polytechnische Schule*) are financed by the municipalities, municipal associations and the *Länder*.

Lower and upper secondary academic schools (*Allgemeinbildende höhere Schulen*, or AHS) (1), and full-time technical and vocational schools and colleges (TVE) receive their funding from the federal authorities.

Depending on the curriculum, **teachers** themselves decide on the teaching methods to be used and the content of work in the classroom.

3 Public/private partnerships

- Vocational education, in particular, has enjoyed a long association with companies such as Siemens or Philips (for example, the industrial sector can be represented on the committees of these schools).
- In Vienna, there is cooperation between schools providing compulsory education and the city aimed at ensuring that schools are supplied rapidly with computers and secure Internet access.
- Within schools for vocational training (excluding vocational training centres), there are numerous partnerships with the private sector in the field of the humanities, depending on where particular schools are located.

(1) Adult education institutions which cooperate partly with the provinces and municipalities and which are also partly involved in the European regional development initiative 'goal 3 programme'.

(1) Schools providing both lower and upper secondary education.

4 *Major initiatives implemented*

a) Appraisal of the situation in schools (adaptation of facilities/curricula to ICT) by level of education

a1) Lower secondary education (2)

Although their facilities and the level of training of their teachers varies, all *Hauptschulen* have reached a basic level in terms of ICT-oriented facilities and curricula and, in some, this level is more advanced. Schools may devote special (optional or compulsory) courses to ICT and some of them (the so-called 'computer science' schools) exercise their autonomy by making this field a priority. Schools are being rapidly connected to the Internet and several of them already have their own home page.

a2) Schools for vocational training (excluding vocational training centres)

Since 1998, experiments have been conducted in 131 classes with 66 school websites for more extensive training to boost familiarity with ICT. Various further training projects are also under way: training of teachers to the same level so that they receive industrial certificates in ICT; similar on-line training via the 'eFit' academy (4); academy placements; introduction of a new form of training in information technologies; the establishment of specialised schools in computer technology and communication and data processing; and the obligation in future for all graduates in technical vocational training to have obtained a level II grade in computer science testifying to specialised knowledge in this field, etc.

a3) Upper secondary education

Computer science was introduced as a compulsory subject in the AHS from 1987 onwards. These schools have been linked in their own network since 1995 and, since 1999, all schools for which the federal authorities are responsible have been similarly linked and connected to the Internet. As regards education in ICT, this has recently been included in the curricula of all schools from primary level upwards. Several projects such as the 'school book' action (enabling products associated with the new media to be ordered) or the *Notebook* project (initiated in 2000/2001 and used for entire classes both at school and at home) are being implemented.

b) General initiatives

b1) Establishment of e-Learning academies

Aims: future teachers are being offered special training in order to familiarise them with the educational and teaching potential of the new media and ensure that, from 2002 onwards, a large proportion of them (some 120 000 teachers) (3) have the knowledge required to obtain the 'European Computer Driving Licence'.

Target groups: future teachers (all levels of education).

Progress to date: in 2000, 30-40% of future teachers were already basically familiar with ICT, and there are further incentives for all of them to update and acquire knowledge to the same level.

Measures for promotion and implementation: the following four measures are planned:

- teaching of basic knowledge in the field of ICT (see for example the web site

(2) The *Hauptschule* is a school providing lower secondary education.

(4) See 4 b1) below.

(3) In line with the conclusions of the European Council of Feira (19-20 June 2000).

http://www.ecdl.at) with a view to class work based on the 'learning to teach' project;
- an on-line academy to ensure that all teachers acquire the same ICT skills;
- placements to upgrade knowledge, mainly for future teachers;
- assistance with access to the Internet for teachers familiarising themselves with it for the first time, via the CD-ROM 'eFit, Austrian teachers on the Internet'.

b2) Extending opportunities for training

Aims: training opportunities have been extended (in particular through joint initiatives with high tech companies) to satisfy novel requirements in the area of computer skills and compensate for the shortage of teachers specialised in ICT.

Target groups: pupils and students in secondary and tertiary education, adults.

Measures for promotion and implementation: the following five measures are planned:
- the creation of new training places in ICT in secondary schools, the TVE and the universities;
- the launching of pilot projects (based on self-training) providing evening classes in technical schools;
- revision of the school curriculum (schools for general education) as regards the computer science branch of studies;
- the award of industrial certificates for pupils and students in compulsory branches of study in the AHS;
- the opening of schools to adult training institutions.

b3) Developing on-line teaching content/ educational gateways

Aims: creation of an educational gateway offering direct access to all courses available is planned for the end of 2002. Teachers will be able to develop their courses on the basis of company or university teaching packages and exchange their experience on line; distance courses will be in subject areas for which there is especially high demand, such as those offered by the *Höhere technische Lehranstalt* (*). E-Learning content for higher education will be developed in a separate programme offered to the community on a network basis (*).

Target groups: primary and secondary schools, the TVE and the universities.

Results to date: the end of the first stage of setting up the Austrian educational gateway is planned for the first quarter of 2001.

b4) Setting up of ICT scientific centres

Aims: so that ICT can be even more fully integrated into the universities and TVE, research and development centres will be set up, particularly in fields of study in which Austria can make a pioneering contribution (such as the development of software, computer security, etc.) and derive benefit from cooperation with the industrial sector.

Partners: the ministry of education, the TVE, the universities and the industrial sector.

Measures for promotion and implementation: a number of schemes are well advanced, such as 'Graz – Centre for Science and Research' which is seeking to relocate ICT research bodies wherever conditions are most favourable and set up an Institute for the development of software; the establishment of a computer centre in Innsbruck; and a project to determine conditions for the siting of new firms; building up a network among university teachers using and developing e-content in teaching; building up a database containing e-content and e-Learning projects (*);

(*) Schools specialised in electronic data processing and in organisation.
(*) See website: http://www.nml.at

developing new studies in which ICT is the main field at the universities of Vienna, Salzburg, Klagenfurt, Innsbruck and Linz.

b5) Enriching adult education and training

Aims: this initiative is encouraging access to learning from the level of basic education to university courses, taking in both general and vocational training. With special emphasis on the integration of disadvantaged groups, it will involve the establishment of skills centres for adult education and training, the enhancement of e-Learning models, the preparation of measures for the integration of certain target groups (such as the elderly and women) and the extension of adult education information and guidance.

Target groups: adults with an emphasis on disadvantaged groups.

b6) Promoting the Austrian cultural heritage over the Internet

Aims: a variety of initiatives have been launched following the proposals of President Klestil on 22 October 2000 to encourage the promotion of the Austrian heritage by means of computer science applications. They include the establishment and full development of the multimedia infrastructure of archives, libraries and museums; the setting up of an electronic gateway for museums, cultural institutions and citizens in general; and the marketing of cultural knowledge and assets by the Ministry of Education with the support of firms.

Target groups: museums, cultural institutions and citizens.

b7) Launching of eGovernment in education

Aims: the use of ICT is being generally extended in order to simplify the administration of educational institutions and make it more effective, closer to citizens and more transparent.

Progress to date: the following were established in 2000: information and communication systems in the administrative sector (electronic processing of files, electronic communication and purchasing system, etc.); a Data Warehouse for administrative information; and on-line information on vacant posts in the field of training, etc.

b8) Adapting the infrastructure

Aims: securing efficient Internet access and the best possible facilities for all schools and training bodies.

Target groups: primary schools, secondary schools, the TVE and the universities.

Measures for promotion and implementation: five main measures are particularly noteworthy:

- implementation of the 'computer millennium' to improve ICT infrastructure in schools;
- extension of the Austrian education and training network (ACOnet and ASN) linked to international training and research networks;
- access to the Internet for students at all training bodies;
- preparation of technical norms for the facilities of training bodies (equipment, software, computer networks);
- the promotion of public/private partnerships.

(*) See website http://serverprojekt.fh-joanneum.at/sp/index.php

Portugal

1 Aims and strategies

Aim
Step up the introduction and use of ICT throughout society (the *Internet Initiative*).

Main strategies
Establishment of a Ministry of Education programme coordination group (August 2000) responsible for initiatives concerned with ICT in education and the preparation of a national action plan;

Three further strategies receive support under Prodep III, the funding programme for the development of education in Portugal, as follows:
- the installation of school computer facilities and networks;
- the development of multimedia educational content;
- teacher training.

2 Sharing of responsibilities

The **Ministry of Education** is responsible for the entire education system including the incorporation of ICT into school curricula. **Schools** secure facilities and acquire software under the government programme, *Nónio*. The **Ministry of Science and Technology** is responsible for connecting schools and other institutions, such as libraries, to the Internet.

The **regional authorities** are also responsible for providing ICT facilities in schools. The **local authorities** have carried out this task for primary schools, in liaison with the Internet *na Escola* programme conducted by the Ministry of Science and Technology.

Schools are encouraged to act autonomously by the Ministry of Education and decide how they will use their resources. For example, the *Nónio* programme enables them to acquire software and computer facilities.

3 Public/private partnerships

Certain projects are encouraging partnerships between schools and firms. School projects for the use of ICT may lead to a partnership with Portugal Telecom.

At ministerial level, some projects, such as Netd@ys (1) in which partnerships have been established between the ministry, telecommunications operators and software and hardware manufacturers, are conducive to cooperation with the private sector.

Agreements regarding education have also been reached with Microsoft.

4 Major initiatives implemented

a) **Nónio-XXI Century Programme** *(ICT programme for Schools)*

Aims:
- bring ICT into schools: 750 schools from pre-primary to upper secondary level are being targeted;

(1) The Netd@ys initiative is discussed briefly on p. 18 in Part 2 (The Action of the European Union) of Chapter I (ICT and education: discussion and action at European level).

- develop on-line and off-line educational content;
- broaden cooperation at European and international levels;
- promote studies concerned with ICT in education;
- assess the impact of ICT in schools.

Target groups: all levels of education from pre-primary to upper secondary.
Period: 1996-2000 (first phase of the programme).
Measures for promotion and implementation:

- promotion of projects to incorporate ICT in education, and finance and administer the necessary infrastructure (national call for proposals);
- certification of ICT skills centres in universities, polytechnic institutes, teacher training centres and scientific associations;
- involvement in eLearning, European Schoolnet, Netd@ys, the EU action programme, Socrates, and activities at the OECD (Organisation for Economic Cooperation and Development) Centre for Educational Research and Innovation (CERI).

This Ministry of Education programme corresponds to the eLearning initiative at national level, fully reflecting both national and European objectives.

b) **Prodep III**

Aims:

- provide schools with computers: before 2003, there should be one computer for 20 pupils in primary schools, and one computer for 10 pupils in secondary schools; by 2006, there should be one computer for 10 pupils in all schools;
- ensure that all teachers acquire rudimentary ICT skills before 2006;
- develop multimedia educational content.

Partners: Prodep III: European Social Fund and European Regional Development Development (ERDF).
Target groups: primary and secondary levels, teacher training centres.
Period: July 2000 onwards.
Measures for promotion and implementation: calls for proposals.

c) **Internet Initiative**

Aims:

- ensure that all teachers have a computer in their homes before 2004;
- enable all pupils and students to have access to a computer by 2003;
- enable all citizens to have access to the Internet;
- boost fixed-rate *broadbandwidth* connections (cable TV, ADSL, UMTS).

Target groups: pupils and students, teachers and all citizens.
Period: from August 2000 onwards.

d) ***Internet na Escola***

Aims: extend connections to the Internet, in particular for primary schools which should all be connected by the end of 2001.
Partners: a Ministry of Science and Technology initiative.
Target groups: primary and secondary levels, universities and polytechnic institutes and municipal libraries.
Progress to date: all secondary schools (around 1 600) have been connected to the Internet since 1997. Universities and the polytechnic institutes have 15 connections, and some primary schools also have Internet access.

Finland

1 Aims and strategies

A twofold general objective

Given that the main aim of education is to support the development of a human society based on knowledge, the incorporation of ICT into the education system reflects the following two objectives:

- enabling everyone, in accordance with the principle of equality of opportunity, to acquire the ICT knowledge and skills needed to study and develop their intellectual ability;
- encouraging the development of a real information society based on interactive knowledge.

(Sources: Education and Research 1999-2004. Development Plan. Ministry of Education, 2000 and Education, training and research in the information society. A National Strategy for 2000-2004. Ministry of Education, 1999)

Specific objectives

- Enable everyone to secure access to ICT as a method of learning. ICT will be included in the basic curricula of educational establishments, which will become innovative centres for learning. Tutoring and counselling services, including technical assistance and support for teaching, will be established throughout the country to address the needs of increasingly extensive open and distance learning.
- Improve the quality of education and research through the use of ICT as a resource offering a whole new area of potential. The sectors of education and research will each operate in networks. Projects for network activities will lead to the establishment of a variety of research networks, virtual schools and universities, and to increased interaction between the educational sector and working life. The research will be of high quality and be fuelled by this greater cooperation involving international partners in particular. As a result of these networks, schools will develop new educational strategies. Part of teacher training will concentrate on the development of virtual studies. The use of ICT will make these learning methods more flexible and lead to the development of new forms of open and distance education meeting the needs of a great many people. Finally, the digital transmission of research findings and new learning resources, along with the establishment of virtual libraries, will provide cutting edge information to researchers, teachers and students.

(Source: Education, training and research in the information society. A National Strategy for 2000-2004. Ministry of Education, 1999)

Main strategies adopted

- An initial national strategy *(National strategy for education, training and research in the information society)* was drawn up in 1995 to achieve the foregoing aims. The national 'Information Society Programme' which implemented this strategy from 1996 to 1999 covered the following areas: school computer network activity and methods of in-service education and training for trainers.
- A second phase *(National strategy for 2000-2004)* is being prepared on the basis of an appraisal of the first period. The main findings of this evaluation were that internationally, the information society in Finland was of a high standard, particularly with regard to technological infrastructures, but that there was inadequate and inconsistent use of ICT in education, while investment was earmarked mainly for facilities and the development of computer

networks, notwithstanding a significant increase in expenditure on education, training and research. Four areas of action have therefore been identified for the above-mentioned second phase, as follows: development of the knowledge and skills needed in the information society (in relation to citizenship, the education and training of teachers, and education and training in areas linked to the information industry and the new media); promotion of computer networks as a means of learning (the varied use of networks in teaching and learning, virtual school and university projects); accumulation of information digital capital (expansion and diversification of the content of production); and the strengthening of infrastructure in the education and research sectors. Both implementation of the principle of lifelong learning and cooperation between the private and public sectors would be essential to achieving these objectives.

(Source: Education, training and research in the information society. A National Strategy for 2000-2004. Ministry of Education. 1999).

2 Sharing of responsibilities

At central level, the **Ministry of Education** determines the strategy and aims of the information society in the fields of education, training and research. The **National Board of Education** implements and coordinates the programme for basic education, general and vocational upper secondary education and adult education. It is responsible for the creation of networks, acquiring facilities, the production of digital learning equipment, in-service teacher training and the setting up of virtual schools.

At local level, the **local authorities** are a key partner responsible for a major share of the financing of primary and secondary education. Decisions relating to the acquisition of facilities or the determination of local strategies are the responsibility either of the local authorities, or the schools if these tasks have been delegated to them. **Schools and their teaching staff** together decide on teaching methods and course content, as well as teaching/learning materials, etc.

3 Public/private partnerships

There is no specific partnership with computer equipment manufacturers or content producers.

4 Major initiatives implemented

The plan for implementation of the national information strategy for education and research in the period from 2000 to 2004 was published by the Ministry of Education in 2000. It sets out the aims and content of the projects concerned.

(Source: Information Strategy for Education and Research 2000-2004. Implementation Plan. Ministry of Education. 2000)

a) Citizenship skills in the Information Society

Aims: with a view to ensuring that everyone has the skills required by the information society (including technical and communication skills, skills in the acquisition and use of information, expertise as a consumer and the ability to become involved in information society policy), the programme aims to encourage people to learn skills associated with citizenship, to establish a programme for

learning and devise pilot projects, to establish a network along with the basic conditions for implementation of the programme, and to draw attention to information society services and the various resources required.

Partners: adult and higher education institutions, local authorities and libraries, The Finnish Broadcasting Company and other media, civic bodies and social partners, major firms in the sector, and consultants and administrators concerned with basic services.

Target groups: all citizens and, in particular, groups that are disadvantaged in terms of education and training.

Measures for promotion and implementation: a campaign to inform and heighten the awareness of the entire population, the establishment of an appropriate project that relies on a broad network, together with pilot projects, a project coordinated by the local authorities and geared to local needs, and a pooling on the Internet of the expertise of teaching, library and advisory staff for the benefit of all citizens.

b) Training for teaching staff

Aims:

- develop a strategy for the use of ICT in education (in teacher training units by 2001 and in educational establishments by 2002);
- train over half of all educational staff in the use of ICT as a tool for teaching and provide the majority of teachers with basic knowledge of ICT.

Partners: education and training in ICT is provided by the universities, the polytechnics and the National Board of Education.

Target groups: teachers.

Measures for promotion and implementation: teacher training is planned in three stages:

- mastery of basic computer techniques (word processing, Internet browsers, e-mail addresses) and understanding of the principles governing the use of ICT in education;
- a sound grasp of the use of ICT in education (different ways of using electronic addresses, as well as the Internet and 'groupware', including generic tools, teaching applications, digital equipment available on the subject and some rudimentary knowledge regarding the production of digital learning equipment), familiarity with software and developments in hardware, and an understanding of issues surrounding the development of ICT;
- a good grasp of specialised knowledge in the case of some 10% of teachers (applications for professional purposes or related to specific content, production of digital learning equipment, information management, assistance and training for colleagues, active involvement in the development of the school community, intervention as network experts).

c) Information industry and digital communication professionals

Aims: this project is part of a programme whose aim is to overcome the labour shortage in information industry sectors, digital communications and the new media through education and initial and in-service training. Its purpose is to make these sectors more attractive, broaden the basis for recruitment, propose measures for developing the quality of education in these sectors and shorten the period of studies.

d) Virtual university

Aims: the aim is to establish before 2004 a virtual university involving universities, research institutes and big firms. The university will produce and deliver high-level edu-

cational services which are internationally competitive. It will provide education for all levels and sectors, including undergraduate, postgraduate, open university and continuing vocational education.

Partners: universities, research institutes, big enterprises.

Measures for promotion and implementation: the means being mobilised are the development of a denser network, diversified provision and quality in education and research, the establishment of appropriate educational services, the application of ICT in education, and the development of an attractive alternative to higher education. These aspects are being supported by the following: work on organisational aspects of the virtual university; the setting up of advisory and evaluation systems in the field of ICT, as well as technical and teaching assistance regarding courses; the development of strategies for the use of ICT in courses; the introduction of in-service teacher training; the creation of a research network to study learning environments; and the production of content.

e) Virtual school

Aims:

- make it possible to study with support from quality teaching based on varied use of ICT, irrespective of place and time;
- enable all students to study and obtain qualifications;
- develop computer networks offering advice, services and educational materials, including internationally-oriented services;
- identify and overcome technical, teaching, social and administrative problems associated with new forms of study and learning;
- use a forum to develop the skills of teachers, students and pupils;
- intensify cooperation between schools and society and, in particular, the world of work;
- develop the principles and practice of appropriate teaching;
- enable all schools to take part in the project.

Partners: the authorities responsible for education, schools and other educational and training institutions and the private sector (production of teaching/learning materials).

Target groups: comprehensive school pupils, general and vocational upper secondary school students, employed persons, teachers.

Measures for promotion and implementation:

- gateway website: propose modules, courses and other educational packages, together with learning materials and ensure the promotion of good practice;
- production of courses for digital radio and television;
- stimulate schools to develop their activities towards a virtual school with the help of gateway website services, training and conferences, and financial support for the acquisition of software and hardware for schools which develop a strategic plan, services and teaching/learning materials.

f) **Research and development (R&D) relating to learning environments**

Aims: the aim is to meet needs arising from the adoption of the information strategy, by devising evaluation and forecasting models for the strategy and by developing new top-quality learning environments which are of special relevance to virtual university and school projects.

Measures for promotion and implementation:

- creation of a multidisciplinary R&D network to offer advice on how (virtual university and school) networks should be developed, formulate proposals on how

ICT can improve schools, encourage close contact between the partners involved and with international centres, and boost the marketing of digital learning products and their use for educational purposes;
- establishment of a multidisciplinary graduate school specialising in research on the learning environment.

g) Content production

Aims: the aims of the project are to step up the development of digital culture, boost the use of national cultural capital and support industries responsible for producing educational content, especially at international level.
Measures for promotion and implementation: launching of initiatives concerned with digital learning equipment, the digital production of content, digitisation of the cultural heritage, the digital management of information, the production of sports-related content, computer networks concerned with tourism, and copyright.

h) Information society structures

Aims:
- construction of a comprehensive hardware and Internet system (education and research);
- management of national and regional resource distribution.

Measures for promotion and implementation:
- analysis of the current situation and organisation of the next round of data gathering;
- launching of an R&D project for a more user-friendly environment.

i) Evaluation of the implementation and impact of the information strategy

Aims: ensure that full benefit is derived from the strategy.
Measures for promotion and implementation:
- constitution of a group of evaluation consultants;
- preparation of a strategy for an ongoing internal and external evaluation;
- implementing a programme for evaluation involving the following: analysis of the current situation (at the end of 2000); annual gathering of relevant data; organisation of an annual evaluation seminar (from 2000 to 2005); special evaluations of priority areas; intermediate evaluation (2002-2003); and a final report (2004-2005).

Sweden

1 Aims and strategies

A twofold general aim

- Enable all to take an active part in public debate and professional life through universal guaranteed access to ICT and acquisition of the skills needed to use it;
- use of ICT as an interactive learning tool to enable all people to upgrade and extend their skills, given that lifelong learning is becoming essential to cope with the rapid changes affecting society.

Specific aims

- Enhance the educational potential and development prospects of schools through use of the new technologies. The *Nationellt program för IT i skolan* (National programme for ICT in schools) supports the development of new technologies in compulsory and upper secondary education, with novel teaching possibilities and new roles for teachers and pupils, a closer interrelationship between society and working life, involvement in efforts to achieve fairness among pupils by enabling them to acquire the same degree of proficiency in ICT, and support to encourage an international outlook on the part of schools.
  The aim of training trainers and teachers is to provide them with the ability to use new technologies as a teaching resource.

- Encourage lifelong learning through the use of the new technologies as a means to learning and the growth of knowledge. Pupils in post-compulsory education should obtain the educational grounding to prepare them for lifelong learning and, in particular, the necessary social and communication skills. Adult education institutions are concerned with offering people the means to develop their learning ability so as to encourage their involvement in social and professional activity. ICT is one of these means. One of the aims of developing teaching about ICT in tertiary education is to encourage lifelong learning.

- Satisfy economic needs and encouraging labour market integration. One of the aims of universities and university colleges now is to meet the needs of workers skilled in the use of the new technologies. These needs are apparent both in high tech sectors, as well as in public administration and business. Meeting them satisfactorily helps young people to enter the labour market.

Main strategies adopted

- Use of new technology as a learning tool at **all levels of education**, including municipal and liberal adult education. Through studying a variety of subjects, pupils and students in **compulsory** and **upper secondary education** learn to use ICT meaningfully as a research mechanism (familiarity with and selection of different sources of information, sorting of data and appraisal of the sources from which it is gathered). **Upper secondary education** also seeks to develop critical attitudes regarding those aspects of ICT which young people study. The Media programme, one of 17 national programmes offered at upper secondary level, is oriented towards media production, i.e. modern information and production technology. Municipal and liberal **adult education** institutions give courses for the acquisition of basic knowledge in ICT-related subjects which students select in accordance with their requirements. In **tertiary education**, an increasing number of courses are using ICT as an educational resource.

Since 1 January 1998, the initial training of trainers includes a specific educational component, namely the use of computers and learning about information technology. The National programme for ICT in schools enables teachers to undergo special in-service training for the purpose of enhancing their skills and knowledge regarding the new technologies.

- Financial investment for incorporating ICT into the education system. Both teacher training and tertiary education are receiving increased financial resources to develop ICT courses.
- Establishment of a national agency for distance education (Distum) to support the application of ICT in the provision of distance education at university level and in liberal adult education.
- Upgrading the SUNET network (linking all universities and university colleges in Sweden). The offer to main municipal libraries and county museums of a fixed on-line connection.

2 *Sharing of responsibilities*

At central level, **parliament** and the **government** are responsible for all publicly funded education and training. At national level, nearly all education comes under the **Ministry of Education and Science**, which formulates the main policies underlying the education system and establishes its curricula. The ***Skolverket*** (National Agency for Education) and the ***Högskoleverket*** (National Agency for Higher Education) are the central administrative authorities, entrusted with supervision and evaluation of the system. The **Ministry of Industry** is concerned with the development of the e-community and some of its activities touch upon education. The government bill *Ett informationssamhälle för alla* ('An Information Society for All') stresses the importance of using ICT in education and the desirability of all citizens acquiring ICT skills.

At local authority level, the **municipalities** which are responsible for public-sector education (except at university level), draw up a programme for schools setting out the measures required to meet national objectives. Many municipalities have introduced strategies which are designed to broaden access to ICT and are also concerned with education. Central and local levels work flexibly together. For example, schools may obtain national subsidies to secure Internet access under the National programme for ICT in schools.

At school level, each **school** draws up a working programme in accordance with the needs and characteristics of its pupils, and determines its educational objectives along with corresponding measures and activities.

Universities and university colleges, which enjoy considerable autonomy in determining their resources and teaching methods, are responsible for the use of ICT in higher education.

Municipalities provide schools with equipment and facilities for their activities, including electronic media equipment and hardware.

3 *Public/private partnerships*

Under the National programme for ICT in schools, agreements which may be renegotiated every six months have been reached between the programme delegation and the computer manufacturers responsible for supplying local authorities with the latest com-

puter equipment consistent with their requirements. Following an agreement with the delegation, the local authorities become the official owners of these computers.

One of the actions under the above programme is to supply teachers undergoing training in ICT with a computer which they will retain for private use on completion of their course.

4 *Major initiatives implemented*

a) ***Nationelt program för IT I skolan*** – **ITiS** (the National Programme for ICT in Schools)

Aims and implementation:

- develop ICT knowledge and skills on the part of teachers and school heads: introduce training for the benefit of some 70 000 teachers;
- ensure that teachers have access to a computer: those who receive training will be supplied with a computer which they will then be able to keep;
- speed up Internet access for schools and provide pupils and teachers with their own e-mail address: agreements for central government to provide municipal subsidies for this purpose;
- improve educational provision for disadvantaged groups: special measures, funding to speed up the development of educational multimedia tools for pupils with functional disabilities;
- develop the Schoolnet (1) network at national and European levels;
- reward teachers who have made an outstanding contribution to the use of ICT in education.

Partners: the delegation responsible for the planning and introduction of the Programme includes representatives from the Ministry of Education and Science, the Ministry of Industry, the National Agency for Education, the Foundation for the Development of Knowledge and Skills, the Information Technology Commission, the Swedish Association of Local Authorities, the National Union of Teachers and the Swedish National Federation of Teachers.

Target groups: mainly compulsory and upper secondary education, but also pre-primary education and municipal adult education.

Period and budget: initially 1999-2002, with a EUR 185 million (SEK 1.7 billion) budget.

Progress to date: the programme is currently being evaluated. Mid-term reports will be examined during seminars. The aims of this Programme largely correspond to those of e-Learning both in terms of access to computers and multimedia tools and increasing familiarity with and knowledge about ICT (connecting schools to the Internet before the end of 2001, training half of all teachers in ICT, providing pupils with computers so that there is one computer for every 9.6 pupils in compulsory education and one for every 5.2 pupils in upper secondary education in 1999, etc.).

b) ***Distum*** (Swedish Agency for Distance Education)

Aims and implementation: the main aim is to boost the development of ICT in distance education. The Agency is responsible for carrying out this task. In order to do so, it implements concrete initiatives (funding and facilities for ICT distance education projects, project monitoring and evaluation, increasing

(1) Its website is http://www.skolverket.se/skolnet

the enrolment capacity of universities which make optimal use of ICT in distance education). The Agency is also responsible for acting as a centre for helpful information on ICT-supported distance education (monitoring and promoting technical progress and research in this field).
Target groups: higher education and 'liberal adult education'.
Period and budget: the Agency began work on 1 July 1999; 1999/2000 budget: EUR 3.55 million (SEK 32.5 million) for university and university college projects, EUR 4.1 million (SEK 37.5 million) for adult education projects; 2001 budget: EUR 1.75 million (SEK 16 million).

c) **SSV** (The National Schools for Adults, distance learning)

Aims: A public authority offering distance education that supplements the adult education offered by the municipalities through distance education programmes and courses at upper secondary school level. Between 1998 and 2000, SSV was involved in a government initiative aimed at developing new ICT-based methods in distance learning. From 2001, the activities have continued within the SSV. A specific budget has been allocated for these activities (see below).
Partners: The SSV is a national institution directly responsible to the Ministry of Education and Science.
Target groups: municipalities and teachers for facilitating distance education for adults at upper secondary level.
Period and budget: 2001 budget: EUR 656 500 (SEK 6 million).

United Kingdom

England, Wales, Northern Ireland

1 Aims and strategies

Complementary general objectives

The government's policy statement *Our information age: the Government's vision*, published in April 1998, embraced the following key areas:

- transforming education – to harness new technology so that all can gain the knowledge and skills they need for the information age;
- widening access – to ensure that the benefits of the information age are open to all, with no split between information 'haves' and 'have nots';
- promoting competition and competitiveness – to help business harness change and prosper, for the benefit of customers, jobs and the wider economy;
- fostering quality – to ensure that the content of new services matches and exceeds the best available today;
- modernising government – to ensure the government uses new technology to deliver better, more convenient services.

Specific objectives

In November 1998, the government issued *NGfL Challenge: Open for Learning, Open for Business*, which announced how the *National Grid for Learning* would be taken forward and adopted the following targets for ICT for 2002:

- connecting all schools, colleges, universities and libraries and as many community centres as possible to the Grid;
- ensuring that serving teachers feel confident and are competent to teach using ICT within the curriculum, and that librarians are similarly trained;
- enabling school leavers to have a good understanding of ICT, with measures in place for assessing their competence in it;
- ensuring that general administrative communications between education bodies and the government and its agencies cease to be largely paper-based;
- making Britain a centre for excellence in the development of networked software content, and a world leader in the export of learning services.

Main strategies

- Connecting schools, colleges and universities to the Internet;
- training teachers, headteachers and school librarians;
- stimulating the development of educational content and software;
- constructing public educational websites.

2 Sharing of responsibilities

The **government** pursues its aims for transforming education by setting out its vision, defining targets, and by allocating substantial additional funding for its specific priorities.

In England, the **Department for Education and Employment** earmarks additional resources for ICT in schools, and sets out the conditions under which these resources are allocated to **local education authorities (LEAs)** and **schools**. For example, for 2001/2002, LEAs must commit themselves to establishing, for all schools, minimum levels of computer provision and Internet connectivity, and access to ICT for management pur-

poses. The bulk of the resources are devolved to schools subject to their agreeing an appropriate ICT development plan, allowing community access to their ICT facilities out of school hours where practical, and having their staff signed up with an approved provider of *New Opportunities Fund training*.

The **National Assembly for Wales Training and Education Department** (NATED) and the **Department of Education (DE)** in **Northern Ireland** also target additional funds according to local needs and priorities, as determined by the National Assembly for Wales and the Northern Ireland Assembly.

There are also a number of **national level agencies** with responsibilities for supporting the government's priorities. As the government's lead agency for the use of ICT in education, **the British Educational Communications & Technology Agency (BECTA)** supports the government and national agencies in the use and development of ICT to raise standards in education. The **New Opportunities Fund (NOF)** is a UK-wide public body responsible for distributing grants for health, education and environment initiatives as determined by the government. The **Teacher Training Agency (TTA)** is the government agency responsible for quality assurance of *New Opportunities Fund (NOF) training* providers in England, and for needs assessment materials.

LEAs in England and Wales distribute the additional funds to schools and provide support in accordance with their own ICT development plans. LEAs in England may also form regional broadband consortia to develop broadband network infrastructure.

In Northern Ireland, the **Education Technology Strategic Management Group (ET SMG)**, which includes representatives from the DE and the Education and Library Boards, has overall responsibility for education technology strategy, including managing the quality assurance of NOF training providers in Northern Ireland which is carried out by the DE inspectorate.

Schools are responsible for developing their own ICT development plans and budgeting for their implementation. Schools may choose whether to spend the additional funds devolved to them on managed services, or on other ICT products. Schools are also responsible for deciding how and when their entitlement for *NOF training* is spent and for selecting from approved training providers.

At further education level in England, responsibility for the development of the *National Learning Network* (NLN) was vested in the **Further Education Information and Learning Technology Committee (FEILT)** until the dissolution of the Further Education Funding Council in March 2001. Implementation is carried out by the **Joint Information Systems Committee (JISC)** which supervises the networking and technical aspects, and a range of other organisations. These include **BECTA**, which manages a number of projects including aspects of staff development, materials and management, and shares the delivery of specific programmes with the **Learning and Skills Development Agency (formerly FEDA), the National Information and Learning Technologies Association (NILTA) and other further education sector organisations**.

At further and higher education level, the **UK funding bodies** (the Higher Education Funding Council for England, the Learning and Skills Council, the Scottish Higher Education Funding Council, the Scottish Further Education Funding Council, the

Higher Education Funding Council for Wales, the National Council for Education and Training (Wales), and the Department of Higher Education, Training and Employment (Northern Ireland)) have established a **strategic advisory committee**, the **JISC**, to provide vision and leadership, and fund the network infrastructure and development projects to support the uptake of new technologies.

3 Public/private partnerships

The government's aims for the *National Grid for Learning* include stimulating change in the private sector, for example by developing the market for educational software and content. This is being achieved by earmarking a proportion of the additional funds allocated to schools for content and software purchase. The government also aims to simplify and standardise the purchasing and management of ICT equipment and services for schools, by encouraging the development of competing managed ICT services. NGfL-Managed Services are tested and certified by BECTA as NGfL-approved, and provide a combination of local networking, hardware, software and content, training and support, often from a number of different suppliers.

The National Lottery funded *New Opportunities Fund (NOF) training* initiative also operates in partnership with the private sector. Providers of training in the use of ICT for teachers and school librarians include public sector bodies such as LEAs and further and higher education institutions, as well as private-sector companies and consortia of public and private-sector organisations. All providers are approved by a central quality assurance system.

The government has also made arrangements with telecommunications companies to offer special tariffs for schools to connect to the Internet.

4 Major initiatives implemented

a) National Grid for Learning (NGfL) (United Kingdom)

This refers both to an educational portal, or gateway web site, and the programme for providing schools and other institutions with appropriate infrastructure.

Aims:

- provide a national learning resource to help raise educational standards, especially to meet the government's literacy and numeracy targets and improve the quality of life and Britain's international competitiveness;
- deliver high quality educational software and services to teachers, pupils and other learners through public/private partnerships;
- remove barriers to learning to ensure quality of access for all, including those in isolated rural areas, those with special educational needs or those in areas of urban deprivation;
- provide an information and learning resource for teachers to improve their ICT skills.

Partners: local authorities (which receive and distribute funding), schools, BECTA (which is responsible for supporting the development of infrastructure and content), and private suppliers.

Target groups: all learners and education and lifelong learning services at all levels of education. However, the initial focus is on teachers and schools.

Period and budget: in 1998-2002, a budget of EUR 1.138 billion (GBP 700 million); in September 2000, the programme was extended to 2004, with additional funding (for England) of EUR 1390.23 million (GBP 865 million). The following targets were set for England for 2004:

- one computer for every five pupils in secondary schools and one computer for every eight pupils in primary schools;
- at least 75% of pupils aged 14 to be able to master electronic information, using new technologies such as CD-ROMs and the Internet wisely in their studies.

Measures for promotion and implementation:

- funding for computer hardware, software, Internet connections, technical training and curriculum resources for primary and secondary schools;
- a mosaic of educationally valuable websites developed in accordance with quality standards;
- *NGfL* approved Managed Services for ICT services;
- training of teachers in the use of ICT (in association with other initiatives).

b) National Learning Network (NLN) and associated actions (England)

This refers to all measures announced by the Secretary of State for Education and Employment in December 1998 in order to develop ILT (Information and Learning Technology) in further education in England.

Aims:

- give students and teachers access to teaching and learning materials, information resources, and new means of communication through connecting institutions to the Internet and linking them in computer networks;
- develop and increase the availability of teaching and learning materials and content;
- staff development to ensure competence and confidence in the use of ICT.

Partners: The Further Education Funding Council for England (whose functions have now been taken over by the Learning and Skills Council) through its Information and Learning Technology Committee (FEILT), the JISC, BECTA, the Further Education National Training Organisation (FENTO), the Learning and Skills Development Agency, National Information and Learning Technologies Association (NILTA), and the United Kingdom Education and Research Networking Association (Ukerna) which manages the JANET network for education and research.

Target groups: further education institutions in England.

Period and budget: from December 1998 to December 2001, a budget of EUR 120.36 million (GBP 74 million).

Measures for promotion and implementation:

- managing and developing the network infrastructure and content;
- supporting the development of learning materials;
- improving local network infrastructure (LANS);
- staff development.

c) Further Education Net (*FE Net*) and Further Education in Action (Wales)

Aims:

- upgrade connection to the Internet (*FE Net*);
- maximise the value of investment made in equipping and networking colleges by a programme of staff development (*FE Net in Action*).

Partners: The Further Education Funding Council for Wales (whose functions have now

been taken over by the National Council for Education and Training for Wales), the JISC, and Ukerna which coordinates the access of institutions to the JANET network in partnership with local support centres.

Target groups: further education institutions in Wales.

Period and budget: the FE Net programme of upgrades was completed in 1997 and extended in 2000. FE Net in Action is funded until 2001. The budget for 1999/2000 for FE Net was EUR 0.97 million (GBP 0.6 million) and for FE Net in Action was EUR 0.13 million (GBP 0.08 million).

Measures for promotion and implementation:

- upgrading Internet connections of institutions;
- staff development.

d) New Opportunities Fund Training (United Kingdom)

This supports the NGfL initiative.

Aims: train teachers and librarians to use ICT effectively in meeting their teaching objectives and enable them to reach the level of expertise in ICT that is required for newly qualified teachers (since 1999 all newly qualified teachers in England and Wales have been required to have competence in ICT to mandatory standards).

Partners: the New Opportunities Fund, the Teacher Training Agency, the National Assembly for Wales Training and Education Department, the ET SMG and the DE (Northern Ireland), local authorities and schools.

Target groups: serving teachers and school librarians at primary and secondary levels.

Period and budget: training must be completed by 2003. EUR 369.65 million (GBP 230 million) is being distributed.

Measures for promotion and implementation: organisation of training courses and the development of materials for teachers to assess their own training needs.

e) Computers for Teachers (England and Wales)

There are various initiatives in England: *Computers for teachers, Laptops for headteachers* and a scheme within the *Fast-track programme*. There is a *Laptops for headteachers* programme in Wales.

Aims: raise teachers' confidence and competence in ICT by enabling them to have personal access to a computer.

Partners: BECTA and independent suppliers.

Target groups: *Computers for Teachers* is restricted to teachers who attend *NOF training*. Phase 1 was oversubscribed, and phase 2 was restricted to teachers of mathematics to 11-14 year olds; the DfEE is currently consulting on how best to target funds for further phases. *Laptops for headteachers* targeted newly appointed headteachers. All teachers selected for the *Fast-track programme* are eligible to receive a free laptop computer, while every secondary head and some primary heads are eligible for *Laptops for headteachers* in Wales. See also the Northern Ireland *Connecting Teachers* project, part of its *Education Technology Strategy*.

Period and budget: *Computers for teachers*: January 2000 to 2002, with a budget of EUR 32.53 million (GBP 20 million) and a further EUR 80.36 million (GBP 50 million) to be made available for future phases; *Laptops for headteachers*: 1999-2000, with a budget of EUR 4.88 million (GBP 3 million) in 1999.

Measures for promotion and implementation:

- *Computers for teachers*: subsidising 50% of the purchase price of laptop or desktop computers for teachers, subject to an upper limit of EUR 813 (GBP 500);
- *Laptops for headteachers*: supplying school heads with laptop computers;

- *Fast-track programme*: supplying laptop computers with Internet access to selected teachers.

f) **City Learning Centres** (England)

City Learning Centres, which are being established as part of *Excellence in Cities* (an initiative to improve the education of city children), use ICT to deliver extended educational opportunities to pupils in targeted areas of major cities. While the facilities are based at a host secondary school, the service provided is shared between a network of named partner schools.

Aims:

- improve access to, and use of, the latest education technology by pupils and adults;
- improve attainment levels through use of that technology;
- increase staying on rates;
- reduce truancy figures;
- improve employment prospects;
- act as test beds for innovation and new ways of teaching and learning.

Partners: LEAs and schools.

Target groups: schools in *Excellence in Cities* areas, and also the wider community.

Period and budget: EUR 160.72 million (GBP 100 million) to provide around 80 centres by the end of 2001-2002.

g) **Joint Information Systems Committee (JISC)** (United Kingdom)

Aims: the JISC promotes the innovative application and use of information systems and information technology in higher education and further education across the UK by providing vision and leadership and funding the network infrastructure, Communications and Information Technology (C&IT) and information services, development projects and educational materials. The JISC sets out its detailed objectives in a five-year rolling strategy. The aims of the proposed strategy for 2001-2005 are as follows:

- build an on-line information environment providing secure and convenient access to a comprehensive collection of scholarly and educational material;
- help institutions create and maintain managed learning environments to support students;
- ensure the continued provision of, and wide access to, a world leading network to support research and education in the UK;
- provide a range of advisory and consultancy services in the use of ICT;
- promote innovation in the use of ICT to benefit learning and teaching, research and the management of institutions;
- improve staff and student skills in the exploitation of ICT, particularly in their use of the Internet;
- support the regional and community agenda of institutions through the Metropolitan Area Networks and Regional Support Centres;
- provide a focus for collaboration between UK educational IT initiatives to help create a wider information-literate society;
- promote and facilitate international collaboration in the exploitation of ICT.

Partners: the JISC is the strategic advisory committee working on behalf of the funding bodies for higher and further education throughout the UK (the further education funding bodies became full funding partners in 1999). The JISC also works in partnership with the Research Councils. It manages the operation and development of the very high bandwidth JANET network through the not-for-profit company Ukerna, supported by a number of JISC Regional Support Centres.

Target groups: higher and further education throughout the UK.

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Period: the JISC strategy for 2001-2005 is expected to be approved by the funding bodies shortly.

Measures for promotion and implementation: improvements to infrastructure (such as the very high bandwidth JANET network) and connecting all institutions, making available scholarly content and developing improved student support systems.

h) ICT for Learning Strategy (Wales)

Aims:

The overarching aims of the ICT for Learning Strategy are to:

- raise standards of attainment in schools across Wales;
- improve ICT skills;
- support lifelong learning;
- help tackle social disadvantage by securing universal access to ICT.

In particular, this strategy seeks to:

- extend the ICT infrastructure to support lifelong learning across Wales;
- create a critical mass of ICT provision in schools and extend its availability to school pupils both during and outside school hours;
- make ICT more readily available for people in disadvantaged communities;
- secure best value from the available funds;
- maximise the educational value of equipment purchased;
- support the wider agenda for overcoming social disadvantage.

Partners: LEAs and schools.

Target groups: all learners, both in schools and the wider community, particularly the socially disadvantaged.

Period and budget: the strategy covers the three-year period 1999-2000 to 2001-2002. The budget is EUR 25.33 million (GBP 15.76 million).

Measures for promotion and implementation:

- school learning centres (ICT resources primarily for secondary schools);
- ICT learning centres (providing access to ICT for the wider community);
- ICT for special needs;
- extending access to ICT;
- ICT enhancements for national cultural bodies (enabling them to communicate their collections to a geographically dispersed audience).

i) Education Technology Strategy (Northern Ireland)

A Strategy for Education Technology in Northern Ireland was issued by the Department of Education Northern Ireland (DENI), now the DE, in October 1997.

Aims:

- equip all schools with a common infrastructure of equipment and on-line educational service through a managed service;
- provide training for teachers to enable them to be personally competent in using ICT equipment and materials and also to integrate ICT into both their teaching and the learning of their pupils;
- provide schools with curriculum content, professional support and guidance on the most effective use of ICT in teaching and learning and school administration and management;
- enable pupils to live, learn and work in the information society.

Partners: the DE, the Education Technology Strategic Management Group, Education and Library Boards, schools, BECTA and the *NGfL* (Classroom 2000), further education institutions.

Target groups: all levels of education and lifelong learning.

Measures for promotion and implementation:
- *NINE Connect*: an educational portal for Northern Ireland includes web-based conferencing and e-mail, and the programme has also provided schools with a common platform of ICT facilities and Internet connections;
- *Connecting teachers*: 1 300 laptops were provided for teachers in primary and secondary schools in 1999, 4 500 were provided in 2000, and 6 000 will be provided in 2001. The laptops are to be deployed by headteachers and shared by teachers to meet specified objectives;
- *Classroom 2000*: ICT-managed services programme;
- *NOF training* as in the rest of the UK.

j) Information Learning Technology (ILT) in Further Education (Northern Ireland)

Aims: ensure that students are given the opportunity to develop ICT skills and competences.
Target groups: students and teachers in further education.
Measures for promotion and implementation:
- staff development – to ensure that all teachers are competent in the use of ICT for teaching and learning;
- development of colleges' internal network infrastructure to allow them to exploit fully the potential of ICT for learning;
- curriculum development to ensure the continued development of ICT-based curriculum material;
- networking – to create a high-bandwidth further and higher education network which will facilitate partnership between the sectors.

k) e-University

Aims: deliver high quality higher education learning over the Internet. Any UK higher education institution will be able to deliver courses and student services through the e-University, provided they meet quality and standards thresholds.
Partners: higher education funding bodies working through the e-University steering group, institutions and private partners.
Target groups: higher education.
Period and budget: planned to start in 2002. The government has provided EUR 100.85 (GBP 62 million) over three years (2002-2004) for the project.

Scotland

1 *Aims and strategies*

Complementary general objectives
- Work for the development of the information society;
- support and/or alter teaching and learning processes and significantly increase educational levels;
- prepare learners for a society based on lifelong learning.

Specific objectives
- Equip students with appropriate experience and skills in ICT to assist their integration and advancement in the world of work;
- enable researchers to pursue their activities on a world-wide basis.

Main strategies
- Teacher training:
  Teachers beginning initial training from 1999 onwards should reach a rudimentary level in ICT. In this respect, major new guidelines regarding ICT have been forwarded to training institutes. Before 2002,

in-service teachers should have acquired the ability to use ICT in their teaching.

Various programmes in higher education are concerned with teacher training. In further education, training teachers in the use of ICT in teaching and learning is part of the strategy adopted by the Scottish Further Education Funding Council (SFEFC).

- Provision of facilities and Internet connections for schools, and development of multimedia services and resources:

  Before 2002, primary, secondary and higher institutions and, as far as possible, community centres will be connected to the Internet, and pupils, students and teachers will have their own electronic addresses.

  Before 2002, the United Kingdom will be highly skilled in the production of educational software.

  The Joint Information Systems Committee (JISC) is developing the SuperJANET network and a wide range of electronic services and resources which can be accessed by higher and further education institutions. The committee is also working on network security and authenticity. The Metropolitan Area Networks (MANs) provide each higher education institution with a high-bandwidth connection, as well as a range of educational courses.

- Training of pupils and students:

  Before 2002, pupils should acquire sound ICT skills as defined in educational curricula (the *Higher Still Core Skills framework*).

2 *Sharing of responsibilities*

The Scottish **government** determines general policy in education.

The role of ***Learning and Teaching Scotland*** (1) consists in advising Scottish ministries and the institutions responsible for ICT courses and applications in education, and in supplying a wide range of innovative products and services.

The **local authorities** and **schools** are responsible for matters concerned with education and for the purchase and maintenance of software and hardware.

Scottish further education institutions award qualifications certified by the **Scottish Qualifications Authority** which lays down the content and aims of each course.

The **Scottish Further Education Funding Council** (SFEFC) has contracted with **Her Majesty's Inspectors of Schools** to conduct quality assurance of educational provision in further education and, in particular, the establishment of effective forms of teaching and learning, including the use of ICT. While the SFEFC finances these institutions, they themselves are responsible for the distribution of funding, including money for the purchase of computer equipment and software. Additional funds have been allocated in line with the chosen strategy for ICT on the basis of proposals from the institutions concerned.

Higher education institutions determine their own aims, qualifications and teaching meth-

(1) Learning and Teaching Scotland is a body which was formed on 1 July 2000 from the amalgamation of the Scottish Council for Educational Technology (SCET) and Scottish Consultative Council Curriculum (Scottish CCC). It is working in partnership with others to develop the curriculum for pupils aged between 3 and 18 and to promote creative and effective use of ICT in education and in learning throughout life. It advises Scottish ministries and other institutions on the use of ICT in learning, and is developing and providing a range of innovative products and services which are supportive of teaching and learning at all stages.

ods. The **Scottish Higher Education Funding Council** (SHEFC) has contracted with the Quality Assurance Agency to conduct quality assurance of educational provision in higher education (definition of the standards required for each subject and, more generally, the adjustment of funding to match those requirements).

The SHEFC finances higher education institutions which, however, are also responsible for the distribution of the resources concerned. The SHEFC assists with the acquisition of software and on-line services at reduced prices

3 *Public/private partnerships*

In the case of higher and further education, agreements have been reached with bodies such as the Joint Information Systems Committee (JISC) and producers of computer equipment and software. Other initiatives, such as SuperJANET 4, involve the private sector.

A small number of further education institutions have turned to private financial concerns in order to build new campuses with ICT facilities.

4 *Major initiatives implemented*

a) Modernisation of schools: implementing the National Grid for Learning in Scotland

Aims: modernisation of schools in terms of computer facilities, the establishment of computer networks and connection to the Internet (one modern computer will be available for 7.5 pupils on average in primary education and 5.1 pupils in secondary education and all schools will be connected to the Internet), and the appropriate use of ICT as a resource for teaching and learning.

Partners: local authorities, primary and secondary schools.

Target groups: primary and secondary schools, teachers.

Period and budget: April 1999 to March 2002: EUR 127.1 million (GBP 80 million).

Measures for promotion and implementation:

- increasing the number of modern computers (under 4 years old);
- increasing the number of networked computers;
- extending and improving Internet access;
- enlarging and improving local and more extensive networks: establishment of links with public libraries and community centres;
- ensuring technical security and management of hardware and software;
- support to teachers so that they make use of ICT in their teaching;
- provision of ICT tools for teaching, learning and skills development of staff in education.

b) Further Education: implementing the National Grid for Learning in Scotland

Aims: exploiting the potential of ICT for teaching and learning.

Partners: the SFEFC.

Target groups: further education.

Period and budget: a three-year programme: EUR 46.1 (GBP 29 million).

Measures for promotion and implementation: development of the network, improving infrastructure and facilities, teacher training, devising new ICT-based content for teaching and learning, and encouraging schools to propose strategies for incorporation of ICT.

c) **New Opportunities Fund ICT Training Programme for Teachers and School Librarians**

Aims: train teachers and school librarians to use ICT effectively.
Partners: programme established by the New Opportunities Fund, a National Lottery distribution body.
Target groups: all in-service teachers and school libraries.
Period and budget: 1999-2002: EUR 36.5 million (GBP 23 million).

d) **Research and development**

Aims: develop new ICT-linked educational content and services.
Partners: the Scottish government in partnership with Learning and Teaching Scotland.
Target groups: primary and secondary education.
Budget: EUR 3.17 million a year (GBP 2 million/year).
Measures for promotion and implementation: financing of a team working at Learning and Teaching Scotland and support for the development of educational content and services for the Internet.

e) **SuperJANET 4**

Aims: improving the national network made up of higher and further education institutions offering on-line resources and services which will operate at 2.5 gigabytes a second from March 2001.
Partners: the JISC.
Target groups: further and higher education.

f) **Use of Metropolitan-Area-Networks Initiative (UMI)**

Aims: exploiting the new possibilities offered by the new Metropolitan Area broadband networks.
Partners: the SHEFC and universities.
Target groups: higher education.
Measures for promotion and implementation: organisation of projects.

g) **SHEFC Communication & Information Technology Programme**

Aims: intensifying the use of electronic tools for teaching/learning and for developing the ICT skills of teaching staff. This programme is a follow-up to the UMI programme.
Partners: the SHEFC and universities.
Target groups: higher education.
Measures for promotion and implementation: organisation of two pilot projects (*the Scottish Middleware Project (ScotMid)* and the *Student-Centric Web-based Educational & Information Management System* (SCWEIMS)) aimed at developing university intranet networks.

Iceland

1 Aims and strategies

Aims

- Adapt teacher education and learning methods to ICT;
- enhance the infrastructure for e-Learning;
- extend content and resources for learning on the Internet.

Main strategies

a) Teacher training:

- offering training in ICT to teachers at all school levels in a way that is tailored to their needs and educationally sound;
- placing greater emphasis on training in ICT in initial teacher training (for compulsory and upper secondary education); extending similar provision to in-service teacher training; ICT courses for teachers in higher education, which are geared to the needs of different subject areas;
- intensification of specialised education in this area in liaison with the ICT industrial sector (higher education);
- training of trainers: training of teachers who then help their colleagues (compulsory and upper secondary education); increasing the number of trainers for future teachers.

b) Producing and transmitting educational content and software on the Internet:

- Internet transmission of educational content and software classified in accordance with official standards, to schools and other educational institutions;
- placing library resources on line for educational purposes;
- improving on-line services (teaching and learning content, databases) that may be easily accessed by teachers and students;
- adapting on-line educational content to the requirements of curricula and providing information on the quality of what is transmitted (compulsory and upper secondary education).

c) Internet connections and electronic networking:

- establishment of wireless networks for portable computers or other mobile devices (upper secondary and higher education);
- broadband connection (at least 100 mb) to the Internet (upper secondary and higher education),
- encouraging the municipalities responsible for compulsory education to improve existing networks for schools and other local institutions, and provide for high speed networks;
- introduction of a high speed research network linking higher education and industry research institutions;
- provision of all schools with a database-driven information system and a website containing information on school activities.

2 Sharing of responsibilities

Pre-schools and compulsory schools come under the **municipalities**. Larger municipalities run **special school offices** which are responsible, among other things, for developing ICT in schools and reaching agreements with suppliers for the purchase of equipment and software. The purchase of hardware and software, as well as their maintenance, are the joint responsibility of the schools and the municipalities.

Upper secondary schools and **universities** are also responsible for the purchase of hard-

ware and software and for maintenance. However, **the Ministry of Education, Science and Culture** awards grants for the purchase of equipment for upper secondary schools and negotiates agreements with suppliers on behalf of the entire education system (special offers for schools and students).

3 *Public/private partnerships*

The Ministry of Education, Science and Culture has reached an agreement with Microsoft. Schools are offered a special price for the leasing or purchasing of Microsoft software. The Ministry is responsible for gathering requests from municipalities and schools and is in turn guaranteed the best possible price for the software.

An agreement also exists between the Ministry of Education, Science and Culture and Icelandic Telecom regarding support for pilot schools in ICT. Icelandic Telecom supplies schools with telecommunications services and technical support and also contributes to the development of software and educational content. The Ministry, for its part, is responsible for running the project, but the Icelandic Telecom representative is a member of the steering committee.

With the consent of the Ministry, pilot schools at upper secondary level have formed a partnership with IBM Denmark and the IBM representative in Iceland for the acquisition of portable computers and the establishment of wireless networks at special prices. IBM supplies schools with wireless senders free of charge while the schools, in turn, lease IBM portable computers for students and teachers.

4 *Major initiatives implemented*

a) Four teacher training projects

- **Aims of the 1st project**: inclusion of the study of ICT in training organisations;
  Target groups: teachers working in compulsory education.
- **Aims of the 2nd project**: provide practical ICT training for teachers in an upper secondary pilot school that specialises in ICT.
  Target groups: teachers in upper secondary education.
- **Aims of the 3rd project**: training students from a small remote town.
  Measures for promotion and implementation: enrolment of the students in an upper secondary school in another town where the municipal authorities provide them with a combination of distance learning and local study facilities, including assistance from local teachers with their on-line learning.
- **Aims of the 4th project**: cooperation between two schools in remote areas to provide teaching via video-conferencing.

b) New resource library system

Aims: provide access for everyone, irrespective of the place of residence, to all library resources and educational materials.
Partners: government and private partners.
Target groups: pupils, teachers and other users at all levels.
Measures for promotion and implementation:

- integration of libraries (in schools providing compulsory and upper secondary education and in universities, as well as specialised and public libraries) into a single common library system operated via the Internet;

- use of the system to provide a gateway to all educational materials that will be based on metadata tagging and linked to the national curriculum;
- agreements with international publishers and other providers of on-line resources to arrange free Internet access for all citizens through a common fee paid by the government,
- a special action programme has been initiated to provide compulsory and upper secondary schools with multimedia educational content.

c) Technology and communications

- **Aims**: virtual education and training.
  Partners: 3 pilot schools.
  Target groups: pupils and teachers in upper secondary education.
  Measures for promotion and implementation: installation, in the three schools, of a portable computer wireless network which students and teachers use for on-line learning. Teachers receive special training in using the computers for teaching purposes.
- **Aims of the 1st pilot project**: implementation, by one municipality, of a programme for use of the computers in teaching.
  Target groups: teachers in compulsory education.
  Measures for promotion and implementation: presence of an ICT specialist teacher who assists the others in using the portable computers for teaching purposes.
- **Aims of the 2nd pilot project**: implementation by the city of Reykjavik of a programme to link up all schools providing compulsory education, by means of a high bandwidth (1 Gb) connection.
- **Aims of the 3rd pilot project**: connect all upper secondary schools, universities and regional continuing education centres into a distance education network. A high bandwidth connection will be established between them to provide for video-conferencing and the exchange of educational material; a temporary video-conferencing bridge will enable small and high bandwidth institutions to communicate in the meantime.

Liechtenstein

1 Aims and strategies

General aims

The general aims of bringing ICT into the education system are in line with the aims of schooling in Liechtenstein. ICT is meant to be used in education for the following purposes:

- to develop interest in lifelong learning and intellectual curiosity;
- to promote individual learning skills.

Specific aim

To make it easier to find employment and enhance professional activity, through the solid grounding in ICT built up during compulsory secondary education.

Main strategies

- Setting up of a 'Computer Science at School' (1) department in the government school administration service at the start of 2000, to deal with educational and technical aspects of introducing ICT into schools;
- an integrated approach in which equal importance is attached to teacher training, hardware and software, and support and maintenance:
  - teacher training: centrally organised and further developed by the 'Computer Science at School' department in liaison with local administrators/teachers; a proposal for four levels of training, in accordance with teacher requirements;
  - investment in hardware and software: fixing by the government of provisional targets corresponding to the country's needs (one computer for four pupils, and one computer for two teachers; steadily developed intranet and Internet connections up to 2001; gradual transfer of administrative tasks, such as school administration, in-service teacher training, etc., to the Internet);
  - support and maintenance: hourly reductions in workload for each administrator/teacher for every 10 computers installed; strengthening the 'Computer Science at School' department with an additional technician for every consignment of 250 computers (three technicians are thus being designated to primary and secondary schools by June 2001); installation of a total 1 500 computers in schools, with one third of this number (including back-up facilities) in secondary schools from 2000 to 2002 and primary school provision completed by 2003; 1.5% of the state budget for education will be earmarked for these investments from 2002 onwards.

2 Sharing of responsibilities

The **government** is responsible for all school legislation and curricular content and for investment in secondary schools. Planning, budgeting and implementation of decisions in these areas are carried out by its school administration service and, more particularly, the 'Computer Science at School' department in the case of ICT.

The **municipalities** are responsible for investment in primary education and are consulted on the content of draft decisions.

(1) See the website: http://www.schulnetz.li

3 Public/private partnerships

Projects such as the development of an intranet (1997/98), the early learning of English (1996-2000), Internet access (2000/2001) and the organisation of Internet prizes (2001) have led to the establishment of public/private partnerships and sponsoring. No specific partnership or agreement exists with providers and/or developers.

4 Major practical initiatives

a) Facilities

Aims: ensure the establishment of a highly effective multi-purpose network for Liechtenstein schools for the sound operation of central intranet and Internet educational services, and improve administrative cooperation in schools and between schools and the school administration service. Since November 2000, all secondary schools have had access to the high capacity network (from 100 Mb to 1 Gb), and the same should apply to primary schools by August 2001.

Target groups: teachers and pupils at all levels from pre-primary to upper secondary education inclusive.

Progress to date: the test phase is almost complete in pre-primary schools, so the impact of using ICT at this level should be measurable.

Measures for promotion and implementation:

- linking all schools via optical fibre cables (all have had free Internet access since 1997 and teachers and pupils can already have e-mail addresses);
- organise special software days, discussions and an Internet prize for pupils, so that the potential of ICT can be constantly enhanced.

The amounts of multimedia materials made available to teachers and pupils, along with the investment earmarked for network infrastructure, are fully consistent with the objectives of the eLearning initiative.

b) Training

Aims: as the use of computers is already very well established at all levels of schooling and is encouraging new forms of teaching, efforts will be focused on (initial and in-service) teacher training in ICT.

Target groups: trainee teachers and teachers at all levels.

Measures for promotion and implementation: four levels have been identified in accordance with the training needs of teachers, as follows: 1) those who need computers to prepare their lessons; 2) those who need computers to give their lessons; 3) teachers of computer science; 4) teachers who are exceptionally knowledgeable about computers and use them constantly.

These measures correspond to Objective 2 of the eLearning initiative (efforts to train at all levels).

c) Development of multimedia services and content

Aims: develop multimedia services and content.

Measures for promotion and implementation:

- transmit content over school Internet web sites, primarily for teachers and pupils but, in certain cases, for parents also;
- provision of a vocational guidance service so that young people have permanent access to the most recent information about national learning opportunities and the latest professional opportunities.

These measures correspond to Objective 3 of the eLearning initiative (development of high quality multimedia services and content).

d) Opening schools to a wide range of people

Aims: ensure that knowledge reaches and is acquired by a wide range of people.

Measures for promotion and implementation: opening schools to people and offering them classes and/or classrooms. These measures correspond to Objective 4 of the eLearning initiative (the development of centres for acquiring knowledge and linking them in computer networks).

Norway

1 Aims and strategies

General aims

- Ensure quality of opportunity in the use of ICT in a context in which globalisation and the surge in the development of new technologies are major issues;
- encourage lifelong learning under circumstances in which the capacity to learn and flexibility of learning methods are recognised on the labour market.

Specific aims

- Improve the organisation of school activity and enhance skills and the potential contribution of teaching, through the development and use of ICT at all levels of education.

  Pupils in compulsory education should acquire a sound knowledge of ICT and the information society and develop a positive attitude towards them. They should be capable of using electronic equipment and media critically and constructively, as tools for doing their schoolwork.

  Teaching about ICT is an integral part of upper secondary education. It is of special importance in vocational courses.

  The twofold aims of higher education are to train students in ICT in line with the expectations of the world of work, the education system and society in general, and to provide them with knowledge that is constantly updated and includes new concepts, methods and technologies.

  The aim of the research and development sector is to stimulate innovation, particularly as regards the use of ICT in education.
- Ensure equality of opportunity in securing access to ICT and the development of skills in this field, and give special consideration to disadvantaged groups in order to improve their capacity for learning and economic and social integration.
- Boost national and international cooperation.
- Provide flexible education and training in accordance with the needs of users.

(Source: Action Plan: ICT in education in Norway 2000-2002).

Main strategies

- Developing the skills of teachers;
- offering primary and secondary schools 'broadband' access at competitive prices;
- developing infrastructure and, in particular, the establishment of a national learning network (with a common gateway website for the transmission of electronic resources and services, which is linked to foreign institutions);
- curricular integration of ICT (for example, pupils at grade 5 should be capable of word processing and writing their own texts and, in grade 8 mathematics, they should be proficient with spreadsheets and generally familiar with ICT). This applies especially to upper secondary vocational curricula, as well as higher education, in which ICT will be an integral part of an extensive range of subject areas;
- measures for disadvantaged pupils;
- development of content in relation to teaching materials, new examination and assessment methods and learning resources;
- research and development: innovative studies and projects, and measures including, in particular, the *Tomorrow's School* project (involving the development of scenarios for the use of ICT in education and its consequences if used).

2 Sharing of responsibilities

At central level, the **Ministry of Education, Research and Church Affairs** is responsible for national education policy, action plans, legal matters and national curricula in primary and secondary education. The **Norwegian Board of Education** is responsible for the sale and distribution of software, user information regarding software developed under the aegis of the Ministry, development and refinement of educational software, infrastructure and Internet access, international cooperation in the area of ICT, electronic teaching resources and the development of networks (the School Network and an Internet-based advisory network).

The **locally-based National Education Offices** are responsible for guidance and information for the local authorities (municipalities and counties), for coordination of activities between the various levels of education, coordination of local development projects, inspections and status assessments.

The **state-run resource centres for special needs education** have important responsibilities regarding software and curricula in education of this kind.

The **local authorities**, which own primary and secondary schools, are responsible for purchasing and administering school equipment and software, the employment of staff responsible for ICT and for skills development.

In **higher education**, **each institution** (university or university college) determines its own curriculum, except in the case of some vocational training programmes (for example, in the fields of teacher training, healthcare and engineering), and is responsible for matters relating to software and hardware.

3 Public/private partnerships

To develop digital study material, the Norwegian Board of Education works in cooperation with publishers and other private partners.

To supply schools with second-hand computers from the private sector, the Norwegian Board of Education has entered into agreements with private partners. The 8 000-10 000 computers required under the scheme in 1999 had the following minimum configuration enabling them to be used for the majority of school tasks and projects: Pentium 90/100, 16 MB RAM, a 500 MB hard disk, keyboard, mouse, screen, network interface card and SVGA video card. In 2000, agreements were reached with Alternativ Data (the scheme operator) and Microsoft (the supplier). The development of networks has also given rise to partnerships.

Uninett, the Norwegian academic network for research and education, offers network services and resources resulting in international communication and exchange of information.

The *Norgeuniversitetet* project (Norwegian University Network for Lifelong Learning), initiated by the Norwegian Council for Higher Education and the social partners, brings together private sector partners and individuals, with higher education institutions. An Internet database will include all continuing education courses at tertiary level. A 'market place' for the exchange of information, in which industry can indicate its skills requirements and higher education institutions provide suitable courses based largely on e-Learning, is also being developed.

The Network University (NVU) currently consists of Norwegian institutions of higher education which provide university and college education on the Internet. It seeks to become the major Internet provider of Norwegian higher education for adults, with a view to facilitating lifelong learning in the workplace.

4 *Major initiatives implemented*

a) Teacher training – ICT in education

Aims: train teachers to use ICT as a tool for teaching.
Partners: the Norwegian Board of Education and the municipalities (which carry out the work at local level).
Target groups: teachers in compulsory education.
Period and budget: four years from 2000 to 2003, with an annual budget of EUR 5.54 million (NOK 45 million) for local authorities, and EUR 3.69 million (NOK 30 million) in 2001 for central and regional support measures.
Measures for promotion and implementation:
- implementation of a national in-service training scheme to develop the competence of teachers in the pedagogical use of ICT;
- emphasis on ICT in initial teacher training will be maintained in 2001: compulsory activities will be organised to develop the experience acquired with ICT and use it as a tool for teaching.

b) The Innovation in Learning, Organisation and Technology pilot project

Aims: use the potential of ICT from the teaching and organisational standpoint.
Partners: The Research and Competence Network for IT in Education (ITU) and local teacher training colleges are responsible for evaluation and guidance; the Norwegian Board of Education and the national education offices at local (county) level handle management of the project.
Target groups: compulsory and upper secondary schools in 9 out of 19 counties.
Period and budget: 3 years from 1999, with an annual budget of EUR 1.85 million (NOK 15 million).

c) ICT in multicultural schools in large cities

Aims: explore the potential of ICT for responding to the challenges associated with multicultural schools, and stimulating and motivating their pupils.
Partners: the ITU is in charge of evaluation and guidance. The municipality of Oslo is the manager of the project in close cooperation with the Norwegian Board of Education.
Target groups: multicultural schools.
Period and budget: 3 years from 2001, with a total budget of EUR 2.46 million (NOK 20 million).

d) ICT in teacher training

Aims: train future teachers to use ICT in their profession.
Partners: teacher colleges and the ITU.
Target groups: trainee teachers.
Period and budget: 2000-2003, with a EUR 3.69 million (NOK 30 million) annual budget.
Measures for promotion and implementation:
- inclusion of ICT in educational and teaching programmes;
- increased use of ICT-based methods in the training of future teachers.

e) The national learning net

Aims: provide the basis for a national infrastructure for learning and act as a common

gateway to Norwegian education, which may also serve as a tool for international cooperation.

Period: the project is beginning in 2001.

Measures for promotion and implementation:

- launching of a pilot project in the first half of 2001;
- providing varied resources and services;
- establishing meeting places.

Bulgaria

1 Aims and strategies

General aim

Develop activities to support the changes in Bulgarian education, thus preparing the young generation for the information society.

Main strategies

- Development of study content, teaching methods and teaching materials, with reference to state educational requirements in the field of ICT;
- provision of schools with hardware, software and Internet access;
- introduction of ICT into the study process, in compliance with new state educational requirements, and the development of special educational software for use in the teaching of other subjects;
- development of partnerships for financing and project development;
- establishment of resource centres;
- initial and in-service training of teachers and policy-makers in accordance with the policy for bringing ICT into education;
- development of the legal basis for incorporating ICT into education;
- development of programmes for the individual training of pupils;
- development of a system for national-level monitoring of the incorporation of ICT into education;
- development of a strategy for cooperation with the public sector while implementing national policy for ICT in education.

2 Sharing of responsibilities

At **central level**, the Ministry of Education and Science develops the national strategy as well as the programme for its implementation. The Ministry is also in charge of the development of state education requirements in ICT, defining the content of studies and specification for equipment and facilities. Financial assistance comes from the state budget.

At **local level**, the authorities concerned are responsible for financing programme implementation from their local budgets.

The **schools** are the real players in programme implementation. They are also encouraged to raise additional funds.

3 Public/private partnerships

The most noteworthy national initiatives and projects already implemented are the following: the Open Society Foundation Programme I*EARN for international communications, which involved over 70 secondary schools; the IBM education initiative for Bulgaria, a joint initiative on the part of IBM-Europe, the Bulgarian Ministry of Education and Science and the Open Society Foundation for ICT implementation in different subjects; the widely-used British Council programmes *Train the trainer* and *Cross-cultural studies*; and the *ViFax* Programme for distance learning in French, using satellite connection and the Internet.

4 Major initiatives implemented

Participation, prior to 1999, in projects aimed at introducing ICT into education.

Progress to date: acquisition of initial knowledge and skills in the use of personal computers.

Development of the *Inkonet* programme to establish the information society at national level. Programme implementation involves the provision of primary, basic and secondary schools with hardware, software and related facilities, the development of ICT training standards, and ongoing in-service teacher training.

Progress to date: the development, from June to December 1999, of state education requirements for ICT, thus developing the legal basis for teaching it as a subject and using it in schools: from 2000 to mid-2001, the provision of hardware and software for 10% of primary schools, as well as 10% of basic and upper secondary schools, and schools for pupils with special educational needs.

Czech Republic

1 Aims and strategies

General aim

Inclusion of ICT in the education system to develop a real information society.

Specific aims

- Enable teachers (in basic and upper secondary education) and documentary research librarians to acquire a sound grasp of the fundamentals of ICT and use it constructively in their work;
- enable schools providing basic and upper secondary education, as well as libraries, to become information centres with ICT facilities for everyone;
- train 75% of teachers in upper secondary education to use ICT as a teaching resource before the end of 2005;
- ensure a sound grasp of the rudiments of ICT, in basic and upper secondary education, before the end of 2005 (1);
- enable upper secondary schools to contribute to the training of citizens in ICT before 2005 for the purpose of lifelong learning;
- enable pupils in upper secondary education to acquire a sound understanding of the following: use of ICT to answer questions/solve problems; awareness of the limits of ICT; detection of simple malfunctioning in the hardware system or software; use of algorithms; appropriate use of programme applications; extensive use of the Internet; participation in teleconferences and other communication forums, teamwork on local, national and international projects; practical use of the World Wide Web (production and transfer of complex multimedia documents).

Main strategies

- Provision of schools and libraries with computers connected to the Internet;
- presence of an ICT coordinator in each school to help teachers and pupils use the technology as a resource for teaching and learning;
- a shift in emphasis in teacher training to move from a methodology concerned with the transmission of information to one concerned with problem-solving, greater emphasis on the use of ICT, increased cooperation between teachers, inclusion of ICT in teaching on any subject or issue, and increased use of ICT to teach handicapped pupils;
- introduction of programmes for lifelong learning;
- introduction of programmes to encourage teachers, researchers and manufacturers to discover efficient ways of using ICT;
- analysis and assessment of ICT policy.

(Source: Koncepce státní informační politiky ve vzdělávání (the Conception of the State Information Policy in Education) and *Realizace státní informační politiky ve vzdělávání* (the Implementation of the State Information Policy in Education)).

2 Sharing of responsibilities

The **Ministry of Education** stipulates the educational standards to which various programmes may be prepared subject to ministerial approval. **Schools** are responsible for

(1) Basic ICT skills are defined as ability to do the following: use a computer and its peripherals as a tool; understand structure and text and produce simple multimedia documents; use a computer purposively as one wishes; extract and sort information needed for problem-solving.

their educational content and the teaching methods used.

The **Ministry of Education** is the main source of funding for projects to carry out the aims enumerated above. This policy is also partly financed by the **regional and local authorities**.

The **Ministry of Education** is responsible for the purchase and maintenance of hardware and basic software for all levels of education. The purchase of specialised software is undertaken at **local level** or on the initiative of **school management**.

3 *Public/private partnerships*

The official documents (see 1) call for the selection of a general contractor and a general auditor, particularly in the case of the 'Infrastructure' project (see 4 (c) below). The former supplies schools with technologies and services. The latter ensures that schools and the contractor comply with the agreements and methodology set out in the 'Infrastructure' project.

4 *Major initiatives implemented*

The programmes launched to carry out the planned objectives have resulted in three projects.

a) Information literacy

Aims: train teachers, documentary research librarians and citizens in the use of ICT.

Partners: Coordination Centre of the Ministry of Education, *Ceská informatická společnost* (Czech Information Society).

Target groups: teachers, documentary research librarians, citizens in general.

Period and budget: 2001-2005, with a total budget of EUR 53.82 million (CZK 1.822 billion).

Progress to date: in 2001, some 15% of teachers were familiar with the rudiments of ICT and 3% had reached an advanced level.

Measures for promotion and implementation:

- training 75% of teachers to acquire basic familiarity with ICT;
- training 25% of teachers to an advanced level in ICT;
- training ICT coordinators;
- offering an adequate number of courses in different subjects;
- calling on schools to use ICT and contribute to the training of citizens.

b) Educational software and information sources

Aims:

- incorporate ICT into teaching and school activity and exploit the fresh potential offered by computer network activity in schools;
- encourage research and the use of new learning and working methods in this information environment;
- promote experience, products and tools that have proved successful and be responsive to areas of international experience.

Partners: Coordination Centre of the Ministry of Education and an expert council responsible for internal supervision and evaluation.

Period and budget: 2001-2005, with a total budget of EUR 23.49 million (CZK 795 million).

Measures for promotion and implementation: establishment of an educational gateway, pilot projects, on-line distance education and broader access to information resources.

c) **Infrastructure**

Aims:

- provide schools with ICT;
- ensure that all teachers and 8% of pupils can access the corresponding services.

Period and budget: 2001-2005, with a total budget of EUR 137.69 million (CZK 4.660 billion).

Partners: Coordination Centre of the Ministry of Education, the general contractor and the general auditor.

Measures for promotion and implementation: preparation of a set of regulations for ICT suppliers to follow and initiation of pilot projects.

Estonia

1 Aims and strategies

General aim

Aims are entirely consistent with the objectives of the European 'eEurope – Information Society for All' initiative. Incorporating ICT into education systems will be conducive to the emergence of a knowledge and learning society, and ensure that the country becomes a competitive member of the global information society.

(Source: Tiger Leap Programmes Development Plan, Tiger Leap +).

Specific aims

- Enable pupils and teachers to acquire ICT knowledge and skills, as a result of clearly defined and organised special curricula. Pupils should acquire basic skills in ICT. As a result of sound training, teachers should acquire ICT skills and the methodological skills for basic education. They should be able to apply this knowledge to their daily teaching activity. Teachers and school heads should be fully aware of the role of ICT in the learning process, school management and school communications.
- Encourage access to information and ICT. Pupils should be able to access information, and have access outside the classroom to computers connected to the Internet. Teachers should be able to have access to information and ICT facilities (typical scenarios and approaches for work in various subject areas, time and resources, e-mail addresses). Parents and the general public should be able to access the Internet to obtain up-to-date information about education and school activity.

(Source: Tiger Leap Programmes Development Plan, Tiger Leap +).

Strategies

- ICT skills development for pupils, teachers and educational administrators, by means of regularly updated programmes and advanced training courses;
- the development of virtual learning through the production of electronic learning methods, educational software in Estonian, support for virtual collaboration among teachers, the establishment of virtual secondary education and legislation on virtual learning.
- support for the development of infrastructure: increased provision of schools with hardware and software; good quality Internet connections and technical facilities in schools;
- increased collaboration between the government, local authorities, schools and parents.

(Source: Tiger Leap Programmes Development Plan, Tiger Leap +).

2 Sharing of responsibilities

At central level, the **Ministry of Education** finances and coordinates the purchase of hardware with support from **the Tiger Leap Foundation** which redistributes the money to schools and local authorities. The Ministry and the Foundation are responsible for evaluating and purchasing software. In-service teacher training is also financed by the Ministry and supported by the Foundation.

Schools and **local authorities** are responsible for the maintenance of equipment and facilities.

Basic teacher training college provision is expected to include general courses on computer science, and instruction in methodology relating to the use of ICT. **Teacher training**

colleges, other teacher training centres and **the Tiger Leap Foundation** are responsible for in-service teacher training.

3 *Public/private partnerships*

A leading Estonian manufacturer and other foreign manufacturers provide for the implementation of these initiatives. However, educational software tends to be mainly produced by individual specialists or universities rather than by companies, which are not really interested in the relatively modest demand for it.

4 *Major initiatives implemented*

a) Tiger Leap 1996-2000

Aims: the aims of this national programme were to improve infrastructure and, in particular, increase the number of computers in schools.

Partners: the Tiger Leap Foundation, Ministry of Education, Tartu University and Tallinn Technical University, PHARE Information Systems in Education Programme, INTEL, Scottish Centre for Educational Technology, Estonian Educational and Research Network (EENET).

Target groups: basic and upper secondary schools.

Period: 1996-2000, with a EUR 10.51 million budget.

Measures for promotion and implementation:

- plan for financing and allocations on the part of local authorities (EUR 5.6 million), organisations and firms (EUR 128 000);
- teacher training;
- provision of schools with software;
- establishment of development and training projects (such as the construction of a gateway and computer networks for teachers).

Progress to date: the programme was evaluated when it ended in 2000:

- one computer is available for 25 pupils on average, and each school possesses at least one computer. Three-quarters of the schools have on-line connections, while others have either dial-up connections or no connection;
- out of 17 000 teachers, 10 900 received training with support from the programme, while 2 600 teachers were involved in high level courses;
- 61 kinds of educational software, 39 of them new, were provided;
- 172 development and training schemes were established.

b) Plan to implement the Tiger Leap + Programme

Aims: implementation of the Tiger Leap + development plan.

Partners: the Tiger Leap Foundation whose board includes representatives of government and the local authorities, the Estonian association of school heads and the Estonian Council of Rectors, as well as private individuals and firms; Ministry of Education, the national centre for exams and qualifications, universities, research institutes, training institutions and government agencies.

Period: 2001-2005.

Measures for promotion and implementation:

- development of a systems for appraising the ICT skills of teachers (1 March 2001);
- in-service training of teachers in ICT and the establishment of certification (up to 2005);
- introduction of courses on the methodology of ICT applications in classes for teachers in

basic and upper secondary education (1 September 2001);
- reference to the level of ICT skills requirements in the job descriptions of school heads (1 June 2001) and training of school heads (up to 2002);
- inclusion of ICT as a school subject in national curricula (1 June 2001);
- identification of the content, aims and expected results of teaching ICT in school subjects; schools may supplement or amend ICT content provided this is done in a way consistent with the subject concerned (up to 2005);
- preparation of a particular system for assessing pupil skills in the 3rd and 4th stages of study, and annual inspection of the system (2001/2002);
- introduction of a pilot examination concerned with ICT skills in the 9th and 12th grades (spring 2002);
- introducing assessment of pupil ICT skills in all schools (1 September 2003);
- take-over by the State of responsibility for the financing and administration of connecting schools to the Internet, with connections established on the basis of needs (1 September 2001);
- production and transmission of teaching and instructional materials – along with international cooperation projects and scenarios for the introduction of ICT into education – on a gateway website for teachers (up to 2005);
- provision of schools with comprehensive ICT facilities, and scope for them to formulate their own development plans (up to 2005);
- involvement of teachers in projects which encourage the use of ICT in teaching (educational software, virtual upper secondary education, international projects, etc.);
- evaluation of the effectiveness of using ICT in education (up to 2005).

Cyprus

1 Aims and strategies

Main principle of policies for bringing ICT into the education system

Development of the intellectual capacity of pupils so that they can become 'lifelong learners' capable of involvement in the information society and the complex society of the 21st century.

General aims (common to all levels of education)

- Enable all pupils to acquire basic computer skills and those needed for the development of the information society;
- enable staff in education to acquire the basic skills needed for the development of the information society;
- consolidate the virtual environments of learning;
- produce electronic publications, and classifye and communicate research findings and teaching materials;
- strengthen the structure of the information society;
- enrich and extend learning and teaching through the use of ICT in all courses.

Specific aims

- Enable pupils in compulsory education to develop their ability to learn and communicate and to be capable of renewing and developing their knowledge and skills;
- develop their ability to use a computer and software, and to explore the Internet;
- enable staff in compulsory education to use the most up-to-date ICT for teaching purposes;
- ensure that secondary schools and higher education institutions become innovative learning centres in which teachers and students work together to develop new teaching applications;
- support students in secondary and higher education in their transition from one level of education to the next;
- enable them to acquire computer programming skills, and to devise and execute Internet applications;
- encourage them to develop an ethos as regards computer science and to appreciate the usefulness of ICT in their own lives.

Main strategies

- Computer facilities, including Internet connections:
  Each primary class at grades 4, 5 and 6 will receive at least one computer, and rooms shared by pupils in other grades and by teachers will have computers by September 2001. All primary schools currently have at least one ISDN or PSTN Internet connection. Each public-sector lower secondary school will receive a computer connected to the Internet in its library, in addition to the computer facilities it already has. In upper secondary education, special classrooms for teaching languages, history, physics and other subjects are connected to the Internet, and all schools have one or two laboratories with computers linked to the local network and Internet access via router and ISDN or PSTN lines.
- Inclusion of ICT in courses:
  10% of primary schools are involved in an experimental strategy for the introduction and use of information technology at this level of education, essentially as a resource for teaching and learning. In public-sector lower secondary schools, information technology has been introduced as a tool in

specific courses (drawing and design technologies, home economics), and will be included twice a week as a subject in its own right to develop the basic skills of pupils. This is the result of a decision of the Council of Ministers in January 2000, and an agreement with the teaching unions, which will implement it from September 2001.

In the first grade of upper secondary education, information technology is a school subject. The introduction of an exam equivalent to the European Computer Driving Licence is envisaged at this level. Specialisation courses are offered in the second and third grades. Most of the time, information technology is used as a resource to support the teaching of other subjects.

2 *Sharing of responsibilities*

The **Ministry of Education and Culture** is responsible for purchasing computer infrastructure, software and network facilities. The Ministry is preparing a new system for basic materials maintenance, but the more extensive maintenance of the computer infrastructure is handled by the private sector following the publication of calls for tender.

The **curriculum department of the Ministry of Education and Culture** is responsible for specifying and developing the courses and changes required to achieve ICT objectives. The **Pedagogical Institute** of the Ministry is responsible for in-service teacher training.

The **Ministry of Finance** provides the budget for development of these activities.

3 *Public/private partnerships*

The information technology department of the Ministry of Education and Culture develops varied multimedia programmes and e-Learning platforms in collaboration with higher education institutions and the University of Cyprus.

4 *Major initiatives implemented*

a) Enabling all schools, teachers and students to have easy access to the Internet and multimedia resources

Aims: extension of school Internet connections and establishment of an intranet in upper secondary schools.

Target groups: schools at all levels of education, pupils and teachers.

Period: until September 2001.

Measures for promotion and implementation: production of a multimedia CD as a teaching resource by the curriculum department of the Ministry.

b) Internet transmission of educational back-up and services

Aims: Internet provision of these facilities.

Partners: government and private-sector partners.

Measures for promotion and implementation:

- identification of educational back-up and service requirements.
- making a specialist or team of specialists available in schools to support the integration of ICT into education.

c) **Teacher training**

Aims: train all teachers before 2003. Before the end of the first round of training provided by the Pedagogical Institute, trainees should be capable of operating computer facilities, using software and exploiting the scope of the Internet to at least the standards required for award of the European computer driving licence.

Partners: government and the Pedagogical Institute.

Target groups: all teachers.

Latvia

1 Aims and strategies

General aim

Develop a sound high quality education system to underpin the cultural heritage and well-being of the country.

Specific aims

Train qualified specialists in computer programming and ICT in order to develop a major economic sector geared to export activity.

Main strategies

a) Computerising the education system:

- preparing pupils, students and teachers to live and work in the information society;
- modernising the process of learning so that it becomes increasingly more effective;
- initiating the LIIS (Latvian Education Informatization System) project (1) in 1997 to form a network of all education institutions through unified informatization of education, management and information services in the education system with the help of modern technologies and a common infrastructure.

b) Training qualified specialists in branches of computer programming and all fields closely linked to ICT:

- developing a professional system of education in these fields;
- increasing the number of higher education graduates in these fields;
- introducing management and specialised marketing courses geared to the production of services in them;
- establishing budgetary arrangements for the training of specialists in information technologies;
- ensuring that the whole of society is informed about the development of the information technology sector in Latvia and the Baltic countries;
- encouraging entrepreneurs to invest in education concerned with the information technologies and computer programming, as well as in professional and academic teaching and research;
- support for learning activity in the field of computer science in secondary schools;
- support for the science of the new technologies through the development of state-financed computer science programmes;
- training specialists to the highest level in information technologies.

(1) The LIIS project is one of the main priorities of the Informatics national programme for the development of the information society.

2 Sharing of responsibilities

At central level, the **government** is financing the LIIS. **The General Education Department of the Ministry of Education and Science** also lays down the guidelines for the educational content selected during the production of software by LIIS project experts.

The Ministry of Education and Science, the University of Latvia, the local authorities and schools are responsible for project implementation. The Ministry, the University of Latvia and the local authorities reach tripartite agreements and determine the number of teachers who will receive training. At regional level, **teacher training** is administered by LIIS **regional centres**.

The LIIS project monitoring committee *(Uzraudzibas komiteja)* confirms the resources earmarked for the various **regions** which may either use them to purchase equipment themselves in accordance with project recommendations, or leave the **government** to do this on their behalf.

Finally, the *eLatvia* programme is administered by the **Ministry for Economic Affairs**, while the *Informatics* national programme is the responsibility of the **Ministry of Transport**.

3 *Public/private partnerships*

There are no major partnerships with manufacturers. Computer equipment is purchased in accordance with the most favourable tender in line with the Law on State Orders.

4 *Major initiatives implemented*

a) LIIS (Latvian Education Informatization System)

Aims:

- incorporate ICT into teaching in accordance with the following guidelines: computers should support but not replace teachers; teachers and pupils should be active participants and not passive consumers; computerisation should be capable of providing equal opportunities for development of everyone, irrespective of external considerations;
- train all teachers (over 40 000) to use ICT in their work, in accordance with the principle of lifelong learning;
- introduce ICT into management and information services.

Partners: the Ministry of Education and Science, the University of Latvia, local authorities and schools.

Period: the initiative got under way in 1997.

Measures for promotion and implementation:

- products for primary schools: methodological materials explaining the content and aspects of new educational projects;
- products to demonstrate interrelationships between certain subjects;
- teaching materials to stimulate the active participation of pupils;
- teaching materials on the subject of Latvia;
- bilingual education;
- training in methodology for teachers;
- involvement of teachers and pupils in the development and approval of products with the support of University of Latvia specialists, particularly by means of project work;
- development of software and methodological materials for independent work, and the introduction of ICT in the learning process.

b) *eLatvia*

Aims: the *eLatvia* programme is a socio-economic initiative intended to improve the effectiveness and competitiveness of Latvia on the world market and improve the level of social well-being. In addition to significant action in the areas of e-commerce *or* e-government, the programme is partly concerned with the availability of basic knowledge related to the information technologies. The aim is that all people should be able to secure access to information and fundamental knowledge and make use of them in the course of daily life.

Period: the programme lasts until 2004.

Measures for promotion and implementation: it is intended that the aims of the pro-

gramme should be achieved by the following means:

- speeding up the computerisation of schools: support for computer-assisted learning, the development of methodological materials and teacher training;
- connecting all schools to the Internet and exploiting its potential for the purpose of learning;
- introducing courses for the provision of basic knowledge in the field of information in all higher education curricula;
- teaching everyone to research information effectively, consolidate it as knowledge and develop the motivation to undertake independent lifelong learning;
- turning libraries into the main centres for provision of information in all fields, and ensuring their uniform distribution throughout the country;
- introduction of the European Computer Driving Licence.

Lithuania

1 Aims and strategies

General aims (at primary and upper secondary levels)

- Develop a new culture of coexistence of education and society;
- make pupils aware of why ICT is important and offering them instruction in the subject;
- include ICT in the education of the entire population.

Specific aims

- The relationship of education and society: making education a more integral aspect of society as a whole and, in particular, developing the principle of lifelong learning.
- Life at school: revitalising school activity, for example by extending the services and tasks of school libraries, and making ICT an integral part of the administration and management of schools.
- Curriculum and teaching methods:
  - including ICT in courses and teaching methods so that all pupils are entitled to educational provision in the subject;
  - ensuring that 'ICT culture' becomes a permanent feature of the entire educational system and promoting innovative forms of teaching and teaching methods.
- Computer equipment and facilities and teaching materials:
  - gradually reaching a level of one personal computer for every 10 pupils in Lithuanian schools, from the 9th to the 12th years, first of all, and then, successively, the 7th to the 9th, the 5th to the 7th and the 1st to the 5th years;
  - modernising school libraries;
  - improving Internet access and establish intranet links in all schools;
  - developing teaching materials;
  - setting up regional ICT resource and service centres and regional centres for in-service teacher training in ICT, which also have distance education facilities.
- Training of teachers, ICT coordinators and information resource librarians:
  - enabling all teachers to benefit from training in ICT: after establishing training levels, enabling all teachers from the 9th to the 12th school years, as well as school librarians, to receive initial ICT training in accordance with those levels, and then extending this provision to all teachers and other educational staff from the 1st to the 9th years;
  - enabling ICT teachers and coordinators to receive initial and in-service training: firmly establishing the levels of training they require;
  - offering school librarians an opportunity to become specialist administrators of their information centre and ICT trainers;
  - developing an effective flexible system of in-service training for teachers so that they can regularly upgrade their teaching skills;
  - introducing a multi-level promotion system for teachers who use ICT.
- Creating much closer links between education and research: mobilising the research sector, higher education institutions and Lithuanian research capacity in general to ensure that ICT becomes an integral part of education.

- Financing and managing the introduction of ICT:
  - initiating and institutionalising a financing and management system to integrate ICT within the education system;
  - establishing a strategy to incorporate ICT into vocational education and training;
  - developing a strategy to establish the permanent infrastructure needed for the creation of ICT networks;
  - developing a strategy for the introduction of distance education into education as a whole.
  - granting official recognition to ICT training bodies.

Main strategies

Devising four consecutive phases for implementation of these strategies:

- Initial phase: provision of the financial and legal basis, the technical requirements and professionals with a sound grasp of the fundamentals of ICT;
- phase involving the modernisation of school libraries and the development of regional in-service teacher training centres;
- phase in which ICT is made an integral part of the educational process: encouragement given to technology-based education for pupils, teachers and the entire population; inclusion of ICT in the teaching and learning of different subjects;
- phase involving the growth of educational networks: development of the infrastructure needed to establish networks and increased exploitation of telecommunications potential in school activities.

(Source: Strategy for making ICT an integral part of education, approved on 18 December 2000, by order No. 1279 of the Ministry of Education and Science, covering the whole of general education, including primary, lower secondary and upper secondary schools, the *gymnasia*, youth schools, vocational schools and special schools).

2 *Sharing of responsibilities*

Before Lithuania became independent, the **Soviet government** was responsible for bringing ICT into the education system. The use of computers in general secondary education got under way in the mid-1980s and computer science became a compulsory subject in upper secondary education. A uniform computer science curriculum drawn up by Soviet scientists was then introduced in all schools. Until 1990, schools were supplied with computer equipment on a centralised basis and it was regarded as a tool for work in clearly defined computer science courses.

Since independence, the **Ministry of Education and Science** has been responsible for introducing ICT into education. In order to inject momentum into the process, it set up the computer science and forecasting centre at the end of 1990, and this has become the centre for information technology in education, which has been give the task of developing ICT policy and providing schools with computers. The centre administers government funds for bringing ICT into general secondary schools. Given the growing importance of ICT, the government is exercising increasing influence.

National-level projects are concerned with the purchase of new hardware and software, Internet connections and the development of national educational computer networks, while **local authorities** deal with the maintenance and refurbishment of equipment.

The **local authorities** are also responsible for the teacher training centres.

Schools determine how ICT will be used in their activities. They are able to assume increasing responsibility in the ongoing drive to enhance schooling and will become more involved in devising and implementing future ICT policy.

3 Public/private partnerships

Under the terms of the *Mokykla informacinei visuomenei* programme (A School for an Information-based Society), the following bodies and persons have agreed to cooperate and support the educational sector: the *Lietuvos Telekomas* company, Microsoft, the Doctor J.P. Kazickas family foundation, Mr V.G. Gruodis, Omnitel (the telecommunications company), the Open Society Fund – Lithuania, the Infobalt association, the Institute of Mathematics and Computer Science, and the Vilcomp, Sonex and Baltic Amadeus companies. A general agreement has led to the setting up of a Council for Support and Coordination which submits proposals to the Ministry of Education and Science and discusses projects.

In 2000, Lietuvos Telekomas and Microsoft organised a support project in north-west Lithuania, in which 95 Internet access lines were installed free of charge, 120 schools were granted preferential rates for Internet use, 180 teachers were offered computers fitted with modems and Microsoft software as a gift and 1228 teachers were given training.

In two projects known as *Telefono linij vedimas* (Instalment of Communication Lines) and *Internetas Lietuvos mokykloms* (Internet for Lithuania's Schools) in the *Kompass* programme launched by Lietuvos Telekomas in September 2000, 82 lines have been installed and 102 schools use the Internet at preferential rates.

The Doctor J.P. Kazickas family foundation, Mr V.G. Gruodis, and Omnitel have launched the first phase of a support project: following a study of applications submitted, 100 schools are to be provided with computer science class facilities (including five computers, a printer, a scanner, and intranet in each school), and Internet access at half the normal rate.

The Vilcomp company has sold over 50 computers to the schools, together with Microsoft software at reduced rates.

Baltic Amadeus has supplied seven schools with computer science class facilities, comprising over 50 computers, and a EUR 27 800 (LTL 100 000) budgetary outlay.

In 2000, the Open Society Fund spent EUR 73 580 (LTL 264 074) on a series of support projects. Schools have also received many educational CDs.

Endorsement letters now received for the three years ahead point to EUR 4.46 million (LTL 16 million) in financial support.

4 Major initiatives implemented

a) **The *Lietuvos mokykla XXI amžiaus informacinėje visuomenėje* programme** (The Lithuanian School in the Information Society of the 21st Century)

Aims: develop the information society, and encourage and promote the use of ICT by pupils and teachers in teaching and learning.
Partners: the centre for information technology in education (an institution which is

responsible to the Ministry of Education and Science and administers the Programme); the Ministry of Education and Science, other institutions for which it is responsible and other organisations involved in carrying out the Programme; local school administrative bodies and educational centres.

Target groups: all schools offering general education.

Period and budget: from 2001 to 2004, with a budget of EUR 80.53 million (LTL 289 million).

Measures for promotion and implementation:

- provision of schools with computers (one computer for every ten pupils);
- creation of a post of computer information resource librarian in all school libraries;
- establishment of internal computer networks in most schools;
- installation of high-speed Internet connections in schools;
- development of educational software and adaptation of foreign software;
- ICT training of teachers from the 1st to the 12th school years in accordance with established levels.

b) ***Mokykla informacinei visuomenei*** (A School for an Information-based Society)

Aims: support the incorporation of ICT into the education system and the government programme for this purpose.

Partners: central authorities and public-sector administrative bodies, firms and other organisations, private individuals.

Target groups: the entire education system.

Period: 2000-2003.

Hungary

1 Aims and strategies

Aims

- Improve education at all levels;
- improve the skills which all people now need to live in the information society;
- support teaching and learning methods (at primary, lower secondary and upper secondary levels);
- encourage the international exchange of knowledge and experience;
- make national cultural and scientific capital accessible and share it.

Main strategies

- Providing the *középiskola* (upper secondary general and vocational schools) and a substantial proportion of *általános iskola* (primary and lower secondary schools) with basic computer equipment and network connections;
- transmission of content over an Internet web site, under the *SuliNet-Írisz* programme (1);
- improving Internet connection facilities in higher education institutions in the last two years under the National Information Infrastructure Development Programme (NIIF): amplification of the pass band by two degrees of magnitude (the aims being to double its capacity each year and improve the connecting speed);
- training: courses organised throughout the country for teachers in service (2); establishment of the *SuliNet* laboratory in several higher education institutions to support initial teacher training in ICT which is now compulsory;
- international involvement: participation in the *ICT and the Quality of Learning* project of the OECD (Organisation for Economic Cooperation and Development) to analyse trends and international experience and build them into national strategies; participation of several bodies in the Minerva action of the Community programme, Socrates;
- databanks and networks to boost access to cultural and scientific resources: establishment of an electronic library providing access to a substantial proportion of Hungarian literature; the construction, by Hungarian libraries, of common databases which can be accessed by the general public; launching of a project to secure access to museum databases; joint action by the Ministry of Education and the NIIF Programme to establish a gateway website providing access to national cultural and scientific content (the aim being to pursue integration of these activities conducted in parallel);
- securing access of higher education institutions to international library materials and periodicals: the Ministry of Education supports the basic services while institutions finance their specific demands.

(1) The address of the website is: www.sulinet.hu. The Hungarian network, *SuliNet-Írisz*, is a member of the *European Schoolnet* network.

(2) In-service teacher training is compulsory but not in ICT. However, most in-service training courses in subject methodology contain elements concerned with the teaching and learning applications of ICT.

2 Sharing of responsibilities

As regards the provision of schools with hardware, the **Ministry of Education** determines relevant strategies and action programmes and undertakes the overall funding of initiatives.

Actual provision of hardware and ICT is the responsibility of the **local authorities**, from which schools get their equipment and materials and receive directly the amounts allocated to them.

For example, in 1997 the Ministry of Education initiated the Sulinet programme as a national strategy for bringing ICT into the education sector: 80% of the *középiskola* and *gimnázium* (upper secondary general schools which may also provide lower secondary education) and 20% of the *általános iskola* were connected before 1998 to the Internet at the expense of the Ministry of Education for five years and provided with a modern classroom containing 7 to 16 computers.

At **regional level**, regular calls for tender by the **Public Foundation for School Education** also provide opportunities for developing ICT in schools. Other ministries occasionally issue open calls to which schools may reply directly.

As regards the provision of software, the **Ministry** has supplied schools with a set of 32 educational CD-ROMs free of charge, under the *Sulinet* programme. Educational content developed in the *Irisz* project may now be downloaded free of charge on the *Sulinet* website.

In addition, **schools** are entitled to buy software of their own choosing with their own budgetary resources.

As far as curricular content is concerned, the 1995 **national curriculum** which has been compulsory since 1998 lays down that children aged between 12 and 16 should receive at least one lesson in ICT a week. From September 2001, the new so-called *Kerettanterv* (Framework Curriculum) will introduce an intermediate level between national and local curricula.

Local provision approved by the **local authorities** will have to be consistent with this new regulation. The aim of the lesson on information technology will be to get pupils interested in ICT, familiarise them with tools, methods and concepts based on it and enable them to use their knowledge in other subjects and in their daily life.

Use of ICT in other courses depends on decisions taken by **teaching staff**, as well as on their own knowledge and the facilities available.

Local, regional and national competitions also concerned with ICT are organised.

As to teacher training, the government finances 80% of provision for in-service teachers, with the remaining 20% paid by the individual teachers involved, the school or other sponsors. Schools decide who should receive training and the form it will take.

3 Public/private partnerships

There are no such partnerships.

4 Major initiatives implemented

a) Equipment, methods and educational content

Aims: improve computer facilities and the quality of methods and educational content.
Target groups: *középiskola* and *általános iskola*.
Measures for promotion and implementation:

- two-pronged action for the development of computer facilities: on the one hand, support to the least developed schools in this respect and especially those in small villages and, on the other, support to those at the cutting edge of innovation;
- a call for proposals and creation of a quality assurance system for products to support teaching (setting up of a committee for educational digital materials).

b) Training in ICT

Aims: organise ICT training courses, including more thorough training in this field in higher education institutions.
Target groups: teachers and future teachers, as well as students expecting to undertake more specialised training in ICT.
Measures for promotion and implementation:

- all bodies for teacher training will have to provide basic courses in ICT;
- higher education institutions will have to provide postgraduate courses in ICT.

c) Research and development

Aims: boost research and development, and circulate and exploit its results.
Measures for promotion and implementation: establishment of networks for communicating and exploiting its results.

d) Supporting bodies

Aims: ensure maintenance of the system and adequate skills levels on the part of users.
Measures for promotion and implementation: establishment of the Systems Operator Service and ICT-based Pedagogy Counselling Service for this purpose.

e) International involvement

Aims: expansion of international professional relations and participation in the work of the most important international organisations.
Measures for promotion and implementation: participation in the *European Schoolnet* network has been an important development.

f) NIIF Programme

Aims: improve Internet access capacity.
Target groups: higher education.
Measures for promotion and implementation:

- participation in the TEN-34 and Quantum (1) European projects;
- participation in the GEANT programme (2): establishment of a connection with the

(1) TEN 34 and Quantum are EU projects for the development of a European research network. They were initiated in February 1997 and at the start of 1999, respectively. The GEANT Programme discussed in the next footnote seeks to extend still further the network developed in Quantum.

(2) Officially launched by the European Commission on 6 November 2000 during the conference 'IST 2000 – the Information Society for All', the European project known as GEANT (the *Gigabyte European Academic NeTwork*) aims to link up previously existing national education and research networks, with a high capacity of 2.5 Gb/second during 2001, increasing this still further in subsequent years. The project is receiving EUR 160 million in funding from the Member States and EUR 80 million from the European Commission. With the national networks, GEANT will cover the entire EU and a number of pre-accession countries, including Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania and Slovakia. Website: http://www.dante.net/geant

Hungarian higher education network, with a 2.5 Gb/second access capacity in 2001, which will then be increased in step with that of other partners.

g) Development of e-Learning materials

Aims: use of electronic teaching materials to improve the quality of open and distance learning courses.

Partners: Ministry of Education, Prime Minister's Office and the public Foundation Apertus.

Target groups: higher education, vocational training, adult education, in-company training.

Measures for promotion and implementation:

- call for tenders to develop e-Learning materials and e-books;
- motivate state and private education institutions to use e-Learning methods.

Malta

1 Aims and strategies

General aim

Contribute to ensuring that children exercise their right to derive full benefit from educational programmes and services which should be available for all.

(Source: National Curriculum, which took effect in October 2000).

Specific aims

- Extend ICT to all schools (at all levels);
- use of computers as an effective learning resource, as in their applications for all subjects taught at primary level, and the use of specialised software in the engineering and finance sectors at post-secondary level;
- familiarise teachers with the use of ICT as an effective tool for preparing and conducting their lessons;
- assist schools with their new administrative responsibilities (resulting from the transfer of administrative duties from the central office to school administrators).

Main strategies

- Financial investment: over EUR 15 million for the entire programme;
- providing primary and secondary schools with computers: by October 2001, each primary class will possess at least 4 multimedia computers, appropriate software, one large monitor, a printer and one portable computer for every teacher (at present, one computer is available for 7 pupils); secondary schools are being equipped with one to three computer laboratories, and an effort is being made to bring down the number of pupils per computer (at present, there is one computer for 20 pupils);
- curricular integration of ICT: introduction of a secondary-level ICT course in October 1998 for forms 1, 2 et 3 and soon all others, in accordance with the terms of the European Computer Driving Licence; use of ICT in secondary-level mathematics teaching in 1998; inclusion of computer science as an optional subject in form 3; proposal to include advanced computer science as a subject in post-secondary education;
- primary schoolteachers were equipped with portable computers;
- teacher training: basic course on the use of multimedia software for all teachers in primary education; financing of a two-year University of Malta evening course for teachers on the use ICT, leading to recognised qualifications; assistance offered to teachers by ICT specialist teachers working in various schools;
- installation of *The Schools Information System* (SIS) to assist schools with administration, which has now been decentralised to their level: provision of the necessary computer equipment (1 or 2 computers, one dot-matrix printer and one laser printer per school); training school heads and administrative staff to use the system (database management module listing information about pupils, pupil attendance and parent information management module, staff management modules, financial management module, timetable management module, module for managing e-mail which will eventually be used by the central authorities and schools to communicate with each other);
- creation of an ICT central unit within the Ministry of Education that coordinates, supports and evaluates new ICT initiatives.

2 Sharing of responsibilities

The programme is financed by the **government** which is responsible for the purchase and maintenance of equipment and facilities.

3 Public/private partnerships

There are no formal partnerships.

4 Major initiatives implemented

a) ICT in primary education

Aims:
- improve the effectiveness of teaching and learning;
- encourage general ICT proficiency.

Partners: Ministry of Education (curriculum department), school heads, educational officers, primary schoolteachers, specialist ICT teachers working in several schools.

Target groups: primary schoolteachers.

Period: 1996-2001.

Measures for promotion and implementation:
- teacher training: training classes of teachers for primary level at the ICT learning centre (25 hours in all);
- assistance offered to teachers with incorporating ICT in their activity, by ICT specialist teachers working in various schools.

b) ICT in secondary education

Aims: train teachers so that they can acquire a sound grasp of the following software: Microsoft Word, Microsoft Excel, Microsoft Access, Microsoft Publisher.

Partners: Ministry of Education (curriculum department), school heads, educational officers, ICT coordinators, teachers of ICT.

Target groups: secondary schoolteachers.

Period: 1998-2002.

Measures for promotion and implementation: teacher training: training classes of teachers for secondary level at the ICT learning centre (125 hours in all).

c) ICT for mathematics teaching

Aims: train mathematics teachers to use appropriate software (Excel Microsoft, Microworld logo, Derive, Cabri-geometré) to support their teaching.

Partners: Ministry of Education (curriculum department), school heads, educational officers, mathematics coordinators, teachers of mathematics.

Target groups: secondary schoolteachers of mathematics.

Period: 1998-2002.

Measures for promotion and implementation: courses for mathematics teachers.

d) *Matsec Ordinary Level* (secondary level computer science)

Aims: include computer science as a subject in secondary state schools within a year (computer science has been part of the curriculum of non-state secondary schools since 1993). Courses are concerned with quantitative phenomena and seek to demonstrate how they occur and may be used to discover algorithmic solutions.

Partners: University of Malta, Ministry of Education (curriculum department), school heads, educational officers, computer science coordinators and teachers.

Target groups: form 3 secondary school pupils.

Period: the scheme began in 1993.

e) ***Matsec Advanced Level*** (post-secondary level computer science)

Aims: enable pupils to increase their knowledge of computer science (its history, current and future trends, and sectorial and social applications of ICT) and to embark on a higher education undergraduate course which covers the technical aspects of ICT.
Partners: University of Malta, Ministry of Education (Department of Further Studies and Adult Education), heads of post-secondary schools, educational officers, computer science coordinators and teachers.
Target groups: SEC-level (Secondary Education Certificate) post-secondary students in computer science.
Period: the scheme began in 1995.

f) **University courses and qualifications for teachers**

Aims: train more teachers to use ICT in their work.
Partners: Ministry of Education (curriculum department), the faculty of education.
Target groups: primary schoolteachers, secondary schoolteachers (particularly of mathematics), teachers of information technology, computer science teachers.
Period: the initiative is ongoing.
Measures for promotion and implementation: financing of training for recognised qualifications in the following areas: information technologies for teaching children in the initial stages of primary education; information technologies for teaching children in the later stages of primary education; information technologies for teaching mathematics in secondary education; information technologies and their applications in upper secondary education; computer science courses.

g) **The Internet in schools**

Aims: provide schools with broad bandwidth Internet connections and pupils with an electronic address and Internet access.
Partners: Malta Information Technology and Training Services (MITTS), Ministry of Education (curriculum department) and school heads.
Target groups: all primary school and post-secondary pupils.
Period: 1999-2003.
Measures for promotion and implementation: initiation of a project by the Ministry of Education, and appointment of a management committee to implement it.

h) **Information and Communication Technology Centre (ICTC)**

Aims: transmit educational content and services through the networks within school, among schools and between schools and the ICTC. The ICTC is a central unit within the Ministry of Education that coordinates, supports and facilitates the introduction of ICT in schools. It has two branches, one dealing with primary education and the other with secondary education. They are called the ICT Learning Centre (Primary) and the ICT Learning Centre (Secondary), respectively.

Poland

1 Aims and strategies

General aims

- Support for the reform of the Polish education system undertaken in recent years at all levels and in all sectors (primary, lower and upper secondary, general, vocational and higher education) and in particular support for its modernisation;
- support for the development of the information society.

Specific aims

- Enable pupils to use the new technologies as an effective resource for learning and researching information, and as a means for problem-solving;
- train future and in-service teachers to adopt ICT not only as a subject to be taught but as a resource to be used when teaching various other subjects.

Main strategies

- Introduction of new common and detailed curricula, at primary and *gymnasium* (lower secondary) levels; preparing for the same development at *lyceum* (upper secondary) level;
- preparation of school textbooks to be used with the new curricula supported by interactive multimedia content on CD-ROM and the Internet;
- training future and in-service teachers;
- launching, in 1999, of the *Interkl@sa* initiative by the parliamentary committee for education, science and youth, the Ministry of Education, local authorities, non-governmental organisations (NGOs), private firms and the media to develop the information society; devising a number of schemes to encourage the introduction of ICT into schools;
- preparation, before the end of May 2001, of a White Paper devoted substantially to education and entitled *Strategy for the development of the information society in Poland for the years 2001-2006 – ePolska.*

2 Sharing of responsibilities

At central level, the **Ministry of Education** draws up the common curriculum, specifying school textbooks and other teaching materials and recommending appropriate software. The Ministry is also responsible for supplying schools with hardware and software, which are financed from the government budget.

The **local authorities** are responsible for using their local budgets to purchase and maintain hardware and software.

Schools prepare detailed curricula, determine teaching methods and cover Internet and current expenditure (paper, ink for their printers, etc.).

3 Public/private partnerships

INTEL and Microsoft take part in the *Teach to the Future* project which has a EUR 555 000 budget for training teachers to use ICT in various school subjects. The goal is to train 100 trainers and 4 000 teachers who will each be responsible for training 20 more teachers.

Microsoft offers reduced rates for the purchase of software funded by the government budget.

CISCO takes part in the *CICSO Academies* project for training Internet and intranet specialists and technicians, in cooperation with the local authorities.

Finally, under agreements signed by the Ministry of Education and TP SA (the Polish telecommunications company), the latter offers free Internet access to schools of up to 600 monthly units identical to those on a phonecard, equal to 3 minutes during the day and 6 minutes at night and weekends.

4 *Major initiatives implemented*

a) An Internet laboratory in each local authority

Aims: provide schools with computer equipment and ICT facilities. In 1998, 2 500 primary and lower secondary schools were each supplied with laboratories containing 10 computers able to access the Internet, and general and educational software, while 7 000 teachers received training (three teachers in every school each had training sessions lasting a total 40 hours).
Target groups: pupils and teachers in primary and lower secondary schools.
Measures for promotion and implementation:
- provision of schools with a laboratory containing 10 computers able to access the Internet, and appropriate general and educational software;
- teacher training.

b) An Internet laboratory in each *gymnasium*

Aims: provide schools with computer equipment and ICT facilities. In 1999 and 2000, 3 300 lower secondary schools were equipped with the above-mentioned kind of laboratory.
Target groups: lower secondary schools.
Measures for promotion and implementation: provision of schools with a laboratory containing 10 computers able to access the Internet, and appropriate general and educational software.

c) An Internet laboratory in each school

Aims: work on the above-mentioned projects, providing primary and upper secondary schools with appropriate facilities in the years ahead.
Target groups: primary and upper secondary schools.

d) The *Interkl@sa* initiative

Aims: boost the use of ICT in schools at all levels of education, reduce the digital divide and help pupils and teachers to become involved in the information society.
Partners: parliamentary committee for education, science youth, the Ministry of Education, local authorities, NGOs and private and media companies.
Target groups: schools at all levels of education.
Period: since 1999.

e) Agreements between the Ministry of Education and TP SA

Aims: provide for school Internet access free of charge.
Partners: the Ministry of Education and TP SA.
Target groups: schools at all levels of education.
Measures for promotion and implementation: agreements between the Ministry of Education and TP SA providing for free Internet access to schools of up to 600 units a month.

f) Teacher training

ICT is taught in most teacher training establishments, although it is not a compulsory subject given the curricular autonomy of higher education institutions. However, according to the Resolution of the General Council of Higher Education, ICT is recommended for inclusion in higher education curricula. Moreover, in the draft legislation on higher education, there is provision for the Minister of Education to define teacher training standards, which include familiarity with ICT.

Romania

1 Aims and strategies

Aims

- Develop a technical and information environment to support educational reform;
- ensure that ICT is widely used in education;
- improve the processes of teaching and learning.

Strategies

- developing the necessary infrastructure at all levels of education;
- training teachers to use ICT as a resource for teaching;
- training school heads in ICT;
- training pupils to use ICT as a learning resource;
- producing educational software geared to curricular requirements;
- boosting open and distance education;
- introducing ICT courses at postgraduate level;
- involving the private sector in the acquisition of equipment and materials and in teacher training.

(Sources: National Strategy for the wholesale extension of ICT, 1998-2002; National Strategy for the development of human resources, 2000-2010).

2 Sharing of responsibilities

At **central level**, the **Ministry of Education** sets out the general policy for ICT in the field of education and initiates projects. The Ministry is also responsible for validating curricula. The **Ministry of Communications and Information Technology**, which is responsible for introducing ICT into all sectors, is also involved in some educational projects.

School inspectorates at regional level coordinate the provision of hardware and software to **schools**. **Local authorities and non-governmental organisations** are responsible for the maintenance of these facilities.

Teachers determine their teaching methods and choose their textbooks from those recommended and approved by the Ministry of National Education.

3 Public/private partnerships

There is no partnership with private-sector providers for extensive implementation of initiatives. However, private firms such as IBM or Xnet are involved in schemes to provide schools with computer facilities. Non-governmental organisations also provide opportunities for partnership.

4 Major initiatives implemented

a) Revitalising education in rural areas

Aims: this project includes action to provide schools with ICT.
Partners: the Romanian government and the World Bank.
Target groups: schools in rural areas.
Budget: EUR 3.35 million for 2000/2001.

b) Management and information system for education

Aims: provide schools with ICT.
Partners: the Romanian government and the World Bank.
Budget: EUR 1.45 million for 2000/2001.

c) Computers for compulsory and secondary education

Aims: provide primary and secondary schools with computer equipment and software, and connect them to the Internet so that each school for compulsory education has a minimum of eight computers, while each upper secondary school has at least 12. Three phases are envisaged in which 15% of schools will obtain these facilities in the first two years, 35% in the third year, and 50% in the final year.

Partners: the Ministry of Education, the national commission for ICT, non-governmental organisations and private companies.

Target groups: primary, lower secondary and upper secondary schools.

Period: 1998-2002.

d) P&G 2000 project

Aims: provide schools with computer equipment and ICT.

Partners: Ministry of Education, big private companies (IBM, Xnet) and non-governmental organisations (Save the Children Foundation).

Target groups: primary, lower secondary and upper secondary schools.

Period: 1999/2000.

Measures for promotion and implementation:

- schools submit project proposals;
- project evaluation and selection (criteria: demonstrate effective use of computers).

Results of the final evaluation: 800 computers were distributed to 160 schools.

e) Programme for initial teacher training in the use of ICT

Aims: train teachers so that they can:

- perform word processing and use spreadsheets;
- research information on CD-ROM, the Internet, or in bibliographic databases;
- communicate over the Internet (send and receive e-mail);
- determine the basic requirements for design of a database;
- use a database management system;
- understand the difference between physical structure (meaning the way data is written in files on the hard disc) and the logical structure of a database (the way data is organised from a logical standpoint and the relations between its constituent elements).

Partners: Ministry of Education, national centre for primary, lower secondary and upper secondary school teacher training, the national council for teacher training, teacher training departments (departments placed in universities which train teachers for primary, lower and upper secondary levels), teachers' resource centres (regional centres attached to county school inspectorates, which train the same target group).

Target groups: teachers undergoing initial training.

Period: 2000-2002.

f) Programme for the in-service training of primary, lower secondary and upper secondary schoolteachers

Aims: train teachers so that they can:

- perform word processing and use spreadsheets;
- research information on CD-ROM, the Internet, or in bibliographic databases;
- communicate over the Internet (send and receive e-mail);

- determine the basic requirements for design of a database;
- use a database management system;
- understand the difference between physical structure and the logical structure of a database.

Partners: Ministry of Education, national centre for upper secondary school teacher training, the national council for teacher training, teacher resource centres.
Target groups: primary, lower secondary and upper secondary schoolteachers.
Period: 2000-2004.

g) Programme for the development of RoEduNet (the Romanian education network)

RoEduNet is a national communications infrastructure within the education system, which is open to non-profit-making organisations involved in education, research or cultural activities.
Aims:
The objectives of RoEduNet are as follows:

- provide Internet access to academic or scientific information related to a given educational field;
- facilitate access to applications based on multimedia technologies;
- develop open and distance education courses;
- provide information for policy-making;
- enable a wide range of people to secure access to information in the field of education.

It is intended to connect all main educational institutions, libraries and county school inspectorates to the Ministry of Education.
Partners: Ministry of Education, local authorities, county school inspectorates.
Target groups: schools and other educational institutions and non-profit-making organisations.

Measures for promotion and implementation:

- first phase: connecting county school inspectorates and the local authorities;
- second phase: connecting county school inspectorates with schools in their area;
- connecting all educational institutions among themselves and setting up an information service for the general public.

h) Project supported by the Ministry of Communications and Information Technology

Aims: speed up the introduction of computers into education and facilitate Internet access in compulsory and upper secondary education:

- develop the human resources needed to initiate pupils into the use of computers and the Internet;
- train teaching staff to use ICT;
- establish eight centres for distance education;
- use e-mail as a means of communication in primary, lower secondary and upper secondary schools.

Partners: Ministry of Communications and Information Technology.
Target groups and budget: compulsory and upper secondary education, with a budget of EUR 44.68 million in 2001, EUR 55.85 million in 2001/2002, and EUR 111.71 million in 2003/2004, amounting to a total budget of EUR 212.24 million.
Period: 2001-2004.
Measures for promotion and implementation:

- establishment of ICT laboratories which provide for Internet access in upper secondary schools (2001);
- determination of minimum equipment and facilities required (2001/2002);
- development of ICT in compulsory education (2003/2004).

Slovenia

1 Aims and strategies

General aims

- Enable everyone to acquire basic skills not only in computer science but in ICT;
- improve the quality of teaching and learning.

Specific aims

- Train teachers and pupils to use ICT;
- computerisation of schools (hardware, software, local network with access to the Internet);
- create new working opportunities in the research and development sectors.

Strategies

These are set out as aims to be achieved:

- defining an overall organisational structure for computerising schools;
- computerising course content and working methods;
- providing schools with modern computers and ICT facilities;
- providing schools with local and international educational computer networks for the transmission of new educational materials;
- encouraging educational staff (teachers, school heads and educators) to use their private computer and ICT and, in particular, multimedia and Internet services;
- boosting the research and development sectors;
- taking part in e-projects.

The foregoing aims and strategies involve all educational levels and sectors from pre-primary to higher education. In higher education, there is greater emphasis on teacher training. The relevant institutions are also involved in achieving these aims and strategies (and include educational bodies concerned with lifelong learning programmes, as well as other bodies offering courses outside mainstream education).

(Source: phases I and II of the *CLE Programme (1994-1997); Information Literacy Education*. Phase II is currently being discussed in the ministries concerned).

2 Sharing of responsibilities

Although not yet formalised, the sharing of responsibilities will involve the **Ministries of Education, Science and Sport**, the **Ministry of the Information Society**, the **local authorities** and **schools**. The Ministry of Education, Science and Sport and the Ministry of the Information Society will be responsible for programme implementation. Another national body to be involved in the Programme, the Council for Information Literacy Education, will be set up in due course.

3 Public/private partnerships

Partnerships will be formed when the Programme is adopted, particularly to provide equipment and facilities and initiate planned activities.

4 Major initiatives implemented

a) The Slovenian network for education and other networks

Aims: interconnection of local education networks and with similar international networks.

Measures for promotion and implementation:
- permanent connection of educational institutions to the Internet for high-speed exchanges (in terms of gigabytes);
- publishing all learning-related activity on the Slovenian educational network and the European network, *European Schoolnet*;
- establishment of a virtual university on the Internet to transmit local and international educational initiatives.

b) Computerising educational structures

Aims: computerising structures concerned with education.
Measures for promotion and implementation: a computerised educational structure will be responsible for:
- cofinancing the purchase of 60 000 network multimedia computers and peripherals;
- supplying and cofinancing basic software and software packages for teaching;
- maintaining equipment, supplementing it each year with new purchases and modernising it;
- employing and training people to organise activities linked to information.

c) Education and training

Aims: use of computers and ICT in teaching and learning.
Measures for promotion and implementation:
- enhancing and updating the knowledge, skills and routine activity of educational staff (15 000 persons annually);
- financing education workshops, open days and projects in all schools;
- organising local and international meetings of professionals to promote projects and exchange experience;
- actively involving eminent educational staff in local and international meetings.

d) Research and development

Aims: create a stimulating research and development environment, and introduce innovation in the use of computers and ICT in education.
Measures for promotion and implementation:
- setting up at least five centres for research, development and innovation in faculties and schools;
- ordering and selecting annually 20 development projects for the production of teaching software and educational materials on the Internet, as well as 100 smaller projects for the production of appropriate educational content on the Web;
- getting involved in bilateral and international research and development initiatives.

e) Teachers, pupils and e-projects

Aims: devising and using new approaches to teaching and learning.
Measures for promotion and implementation:
- creating a teaching and learning information environment in which teachers can be proactive and train themselves;
- creating a learning information environment for pupils, as well as all citizens involved in lifelong learning;
- cofinancing or fully financing national e-projects (Slovenian history and the Slovenian geographical area, the Slovenian language and translation).

f) Experts and money

Aims: provide resources for development and innovation by experts and the computerisation of the education system.
Measures for promotion and implementation: 30 full-time professionals and 200 professionals working for one-third of their time; EUR 46.25 million (SIT 10 billion) a year.

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g) Centres for the computerisation of Slovenian education

Aims: establishment of help centres for working with the Internet, as well as centres for organising the introduction of ICT into education and learning within the education system.

Slovakia

1 Aims and strategies

Aims

The aims underlying the introduction of ICT into the education system are expressed in terms of ICT knowledge and skills required at each level of education:

- enabling acquisition of the basic routine skills needed to use computers in optional subjects at the first stage of primary education;
- enabling acquisition of the basic routine skills needed to use the Internet and the appropriate software for individual school subjects at the second stage of primary education and secondary level;
- attaching particular importance to the study and use of ICT to research sources, so that software specific to certain subject areas can be used in higher education.

(*Source*: Programme Declaration by the Minister of Education relating to curricula defined for each level of education and approved by the Minister: *concept relating to the thorough development of higher education in the 21st century* and *concept relating to the development of education for the new millennium*.)

Strategies

- Establishment and financing of projects by the Ministry of Education;
- development of computer networks between higher education institutions and the universities and connecting to the Internet (SANET project – Slovak Academic Network);
- provision of primary and secondary schools with facilities and connecting them to the Internet (Infovek project);
- training of primary and secondary schoolteachers (*Infovek* project);
- financing school projects (*Infovek* project);
- national and international exchange of information and experience (*Infovek* project);
- boosting cooperation between higher education institutions, developing high quality information systems and use of ICT in education.

2 Sharing of responsibilities

Two kinds of organisation are to be found in **schools**. Some primary schools and all secondary schools constitute autonomous legal entities which are responsible for the purchase of hardware, software, and laboratory equipment, together with the maintenance of equipment.

Around half of all primary schools are the responsibility of their **local authorities** (district offices) which, in the case of these schools, carry out the same tasks. However, schools which are autonomous legal entities may transfer their responsibilities to the local authorities.

The **Ministry of Education** and the **regional authorities** are involved in introducing ICT into schools through pilot projects, such as *Infovek*, or under agreements with Microsoft which supplies schools with the Microsoft Windows operating system and with Microsoft Office.

3 Public/private partnerships

Public/private partnerships have been developed as part of the *Infovek* and EUNIS – SK projects.

As private donors, Telenor Slovakia and Nextra support the *Infovek* project and are particularly active in supplying equipment.

Microsoft is a partner in the EUNIS – SK project and CISCO soon will be. In February 2000, the Ministry of Education signed a contract with Microsoft Slovakia under which the firm provisionally offers cheap rates for the purchase of basic products (a EUR 1.10 licence for the purchase of the Microsoft Windows operating system and Microsoft Office). A similar contract is being negotiated with CISCO.

4 *Major initiatives implemented*

a) SANET – Slovak Academic Network

Aims:

- build a computer network linking higher education institutions and the universities and use it to provide them with Internet access: all the foregoing institutions are now linked to the SANET network;
- extend the network to other institutions, including primary and secondary schools, under the *Infovek* project referred to above: some schools in this category now use this network;
- take part in the GEANT European project, the *Gigabyte European Academic NeTwork* (1).

Partners: the SANET association administered by the Minister of Education (which contributes to the funding of activities) and the European Union (which is responsible for links to the GEANT network).

Target groups: higher education institutions, universities, teaching and research sectors and other institutions, including primary and secondary schools (Infovek project).

(1) For further details on the European project known as GEANT (the *Gigabyte European Academic NeTwork*), see the footnote on p.157, in the national description for Hungary.

Period and budget: since 1991, with a budget of EUR 0.46 million (SKK 20 million) in both 2000 and 2001.

b) *Infovek* Project

Aims: introduce ICT into teaching and learning in primary and secondary schools, by connecting these schools to the Internet before the end of 2002, training their teachers and enabling all pupils to master basic computer skills before the end of 2003.

Partners: the non-governmental non-profit-making civic association, Infovek, the Ministry of Culture which funds the project, and private donors which contribute to its funding, including Telenor Slovakia and Nextra which, respectively, contributed EUR 11 500 (SKK 0.5 million) and EUR 6 900 (SKK 0.3 million) in 2000.

Target groups: primary and secondary pupils and teachers.

Period: since 1998.

Budget:

- the government has promised EUR 9.38 million (SKK 400 million) in addition to the EUR 4.69 million (SK 200 million) already earmarked for the project in 2001;
- in 1999, the EUR 0.46 million (SKK 20 million) allocated by the Ministry of Education were broken down as follows: 91.93% for technical equipment and facilities; 4.34% for Internet connections; 3.66% for education and 0.07% for administration; in 2000, the EUR 1.84 million (SKK 80 million) allocated by the Ministry of Education were broken down as follows: 70.63% for technical equipment and facilities; 20.63% for Internet connections; 6.25% for education and 2.5% for administration;
- in 1999, EUR 0.46 million (SKK 20 million) were awarded to the 80 schools involved in the project; in 2000, EUR 1.88 million (SKK 80 million) were awarded to the 150

schools involved; and in 2001, EUR 4.69 million (SKK 200 million) are being earmarked for a further 1 000 schools.

Progress to date:

- in 1999, 190 teachers were trained in summer schools;
- 80 schools were involved in the project in 1999, and 150 in 2000 (it is estimated that a further 1 000 are involved in 2001).

Measures for promotion and implementation:

- encouraging schools to submit projects on different topics (which so far have included mathematics, ecology, biology, chemistry, information science, the Slovak language and geology, as well as information and new methods concerned with teaching and learning); projects have been selected and funded by *Infovek*;
- teacher training: involvement in the project of the greatest possible number of higher education institutions and universities which train teachers for primary and secondary levels; encouraging the use of ICT in teaching; running summer schools for primary and secondary schoolteachers and offering them various forms of in-service training (doctoral and specialised study, additional or higher levels of qualification, etc.);
- developing and supplying the necessary equipment with donor support;
- connecting schools to the Internet before the end of 2002;
- exchanging information and experience: initiating national and foreign studies for the exchange of information and greater understanding of the classroom use of ICT; participation at national and international events devoted to ICT.

c) EUNIS – SK

Aims: creation of a platform for higher education institutions so that they can cooperate, develop high quality information systems and solve problems relating to ICT and its use.

Partners: EUNIS, the civic association comprising higher education institutions and other members, the Ministry of Education (which contributes to funding), Microsoft and CISCO.

Target groups: students and teachers in higher education.

Budget: EUR 0.35 million (SKK 15 million) allocated by the Ministry for 2001.

Measures for promotion and implementation:

- creation and development of a system for establishing varied forms of communication between workers and bodies which are responsible for the provision and use of ICT in higher education institutions.
- establishing a system to support the career promotion of teaching staff who use ICT;
- communicating and cooperating with national and international organisations involved in the use of ICT in higher education;
- creating an integrated information resource system linking up university libraries and securing access to its material on the part of teachers and students.

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